FACTORY

MANAGEMENT AND MAINTENANCE

SEPTEMBER 1918

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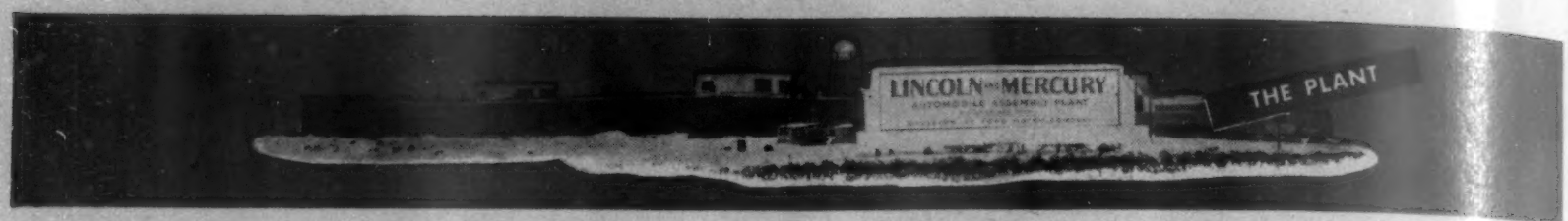
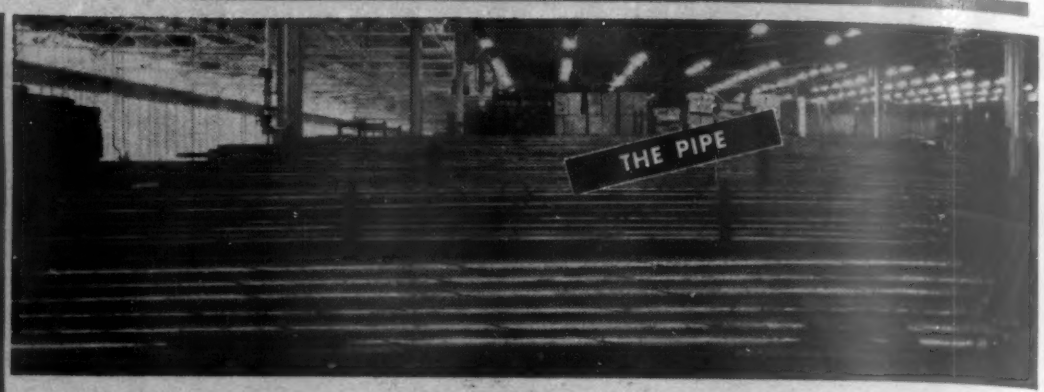


Ford Motor Company uses *BYERS WROUGHT IRON PIPE*



The new Lincoln-Mercury assembly plant at Metuchen, N.J., naturally reflects the latest ideas and developments in every detail of design and construction . . . including major emphasis on the elimination of excessive maintenance. Ford Motor Company engineers specified wrought iron to forestall corrosive attack in certain services. One—illustrated—is recirculating water lines for washing air in the paint spray booths. Another—for which part of the pipe stock is shown—is a water cooling system for transformers to press machinery. The fabricator on this job was Consolidated Installations, Inc.

WATER HAZARD

With all the variety of fluids that piping is called on to handle today, water is still Public Enemy No. One in causing excessive repairs, and excessive replacements. Supplies vary widely in analyses. Only individual study and expert interpretation can predict the probable effect on piping. And only long familiarity with the performance of pipe materials under these varied conditions can provide a safe, sound basis for foretelling performance. A. M. Byers Company has the facilities and the accumulated experience to give right answers to these perplexing questions. And wrought iron has the inherent corrosion-resistance needed to successfully combat attack, in a large majority of situations.

INHERENT RESISTANCE

The corrosion-resistance of Byers Wrought Iron pipe comes directly from the unique structure and composition of the material. Tiny threads of glass-like silicate slag, distributed through the body of high-purity iron, halt and "detour" corrosive attack. The threads also help anchor the initial protective scale, which shields the underlying metal.

ASK FOR DETAILS

A knowledge of the character, manufacture, and properties of wrought iron is an excellent first-step in applying it correctly. Our booklet, "The ABC's of Wrought Iron" covers this entire subject. We will be glad to send you a copy. If you have any specific questions in connection with projected jobs, ask a representative, or the nearest District Office, for information.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, Seattle, San Francisco. Export Division: New York, N.Y.

CORROSION COSTS YOU MORE THAN WROUGHT IRON

FACTORY

MANAGEMENT and MAINTENANCE

SEPTEMBER, 1948

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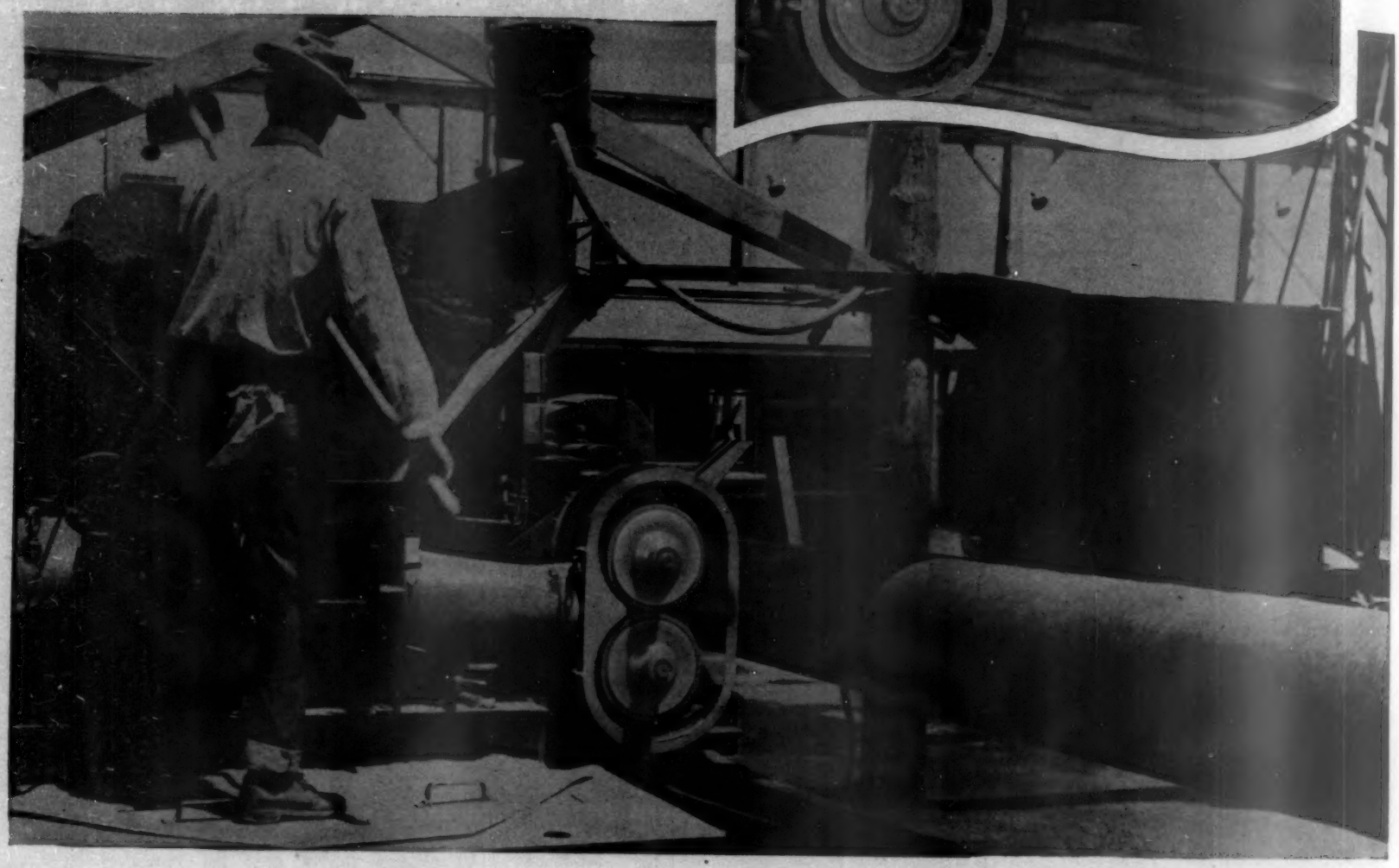
Tailoring concrete jackets with Osborn Brushes



Brushes save money in applying protective coating to cylinder pipe

ONE pass of this machine along a length of steel cylinder pipe and — presto — its surface has a densely compacted concrete coating, uniform in thickness from tip to tip.

Used by the American Pipe and Construction Co., Los Angeles, California, this machine extrudes a dry consistency cement between two sets of counter-rotating Osborn Master Wire Wheel Brushes (shown in inset) operating at a peripheral speed of about 3,600 feet per minute. These brushes spray the mortar onto the pipe which rotates at approximately 40 r.p.m. Speed of application is regulated by a Vari-Drive motor. Thickness of coating is nominally ¾ inches.

Advantages of brush application over other methods formerly used are: (1) A more densely compacted coating is obtained; (2) Loss of material due to rebound is reduced; (3) Uniformity of coating is achieved; and (4) Cost is greatly reduced.

But you don't have to look to the unusual job to discover the savings Osborn Brushes offer. Cleaning, finishing, deburring, polishing—the routine jobs performed daily in every plant can be done faster, better, at lower cost with these modern power tools of industry. An Osborn sales engineer will be glad to analyze your needs—and supply the answers that will mean savings for you. Write or call today.

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FACTORY
MANAGEMENT AND MAINTENANCE
L. C. MORROW, EDITOR

GOOD PUBLIC RELATIONS PROGRAMS MAKE FOR INDUSTRIAL PEACE

GETTING INFORMATION to the man in the street continues to be a leading contestant for action by industrial management. Broadest of the recent undertakings is "Plan for Action," an outline for plant and community programs. It is an attempt to improve public understanding of our economic system.

"Plan for Action" was developed by a joint committee of the Association of National Advertisers and the American Association of Advertising Agencies. It gets down to cases. From the plan, even the novice can adopt specific workable procedures.

No panaceas, no universal formulas are offered. Actually, only the tried and tested procedures well known to industry are dealt with. They include personnel practices, employee opinion surveys, employee communication methods, the open house, plant tours, community relations.

Breaking Barriers to Understanding

By liberal definition, the way to get information to the man in the street is to carry on a good public relations program. Fortunately, the barriers to common understanding can be broken down. The process is a simple one. It consists chiefly of maintaining good policies in human relationships and in keeping all interested people—employees, stockholders and their neighbors, customers, and the general public —informed.

It means telling them in plain terms what revenue is received and where it comes from; what revenue is paid out and who gets it; how an industry serves the individual, the community, and other industries.

Finally, it includes the acceptance of the social responsibilities that the advance of civilization imposes upon business and industry. Add all these things together and you have public relations.

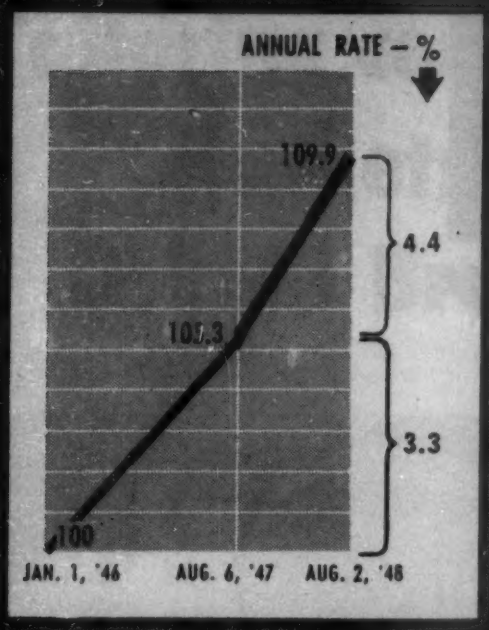
FACTORY has said these things before. It said them ten years ago in almost the same words. It has said them many times since in other words. It now welcomes the opportunity given by the "Plan for Action" to say them again. It welcomes the addition of the efforts of this committee to its own.

Removing the Veil of Secrecy

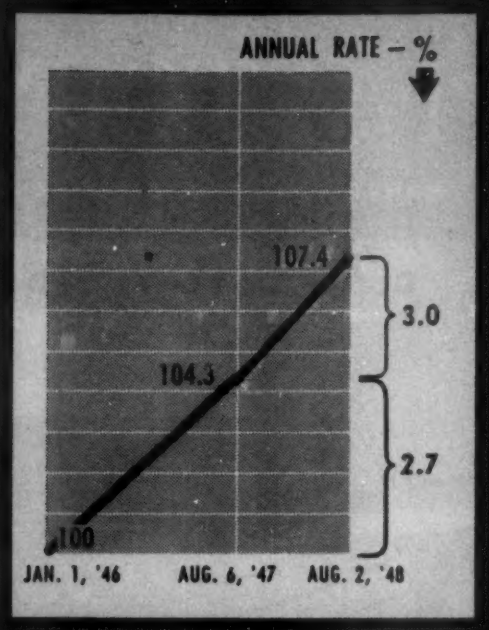
Too many employers have failed to make clear their policies, their practices, and their purposes as they relate to fair dealing with employees, investors, and the general public. Their intentions have been good, but they have cloaked them with a veil of secrecy and made a mystery out of simplicity. As a result, the uninformed have been given plenty of opportunity to exercise their imagination. And they have done it.

The situation is not good. But it is not so bad that it cannot be corrected. The addition of each firm, as it joins the ranks of the companies now working for good public relations, is really worth while.

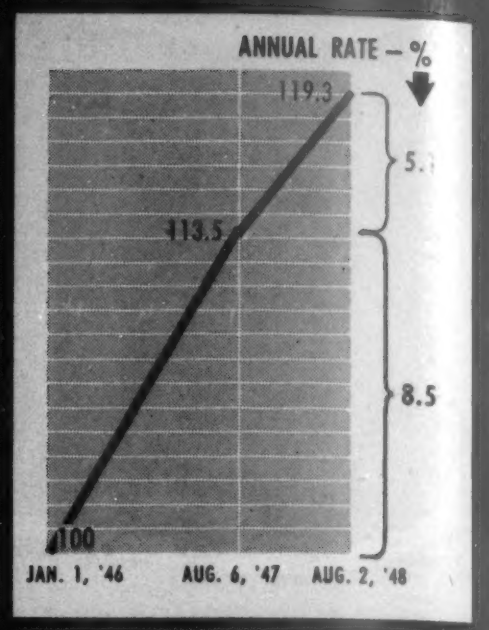
L. C. Morrow



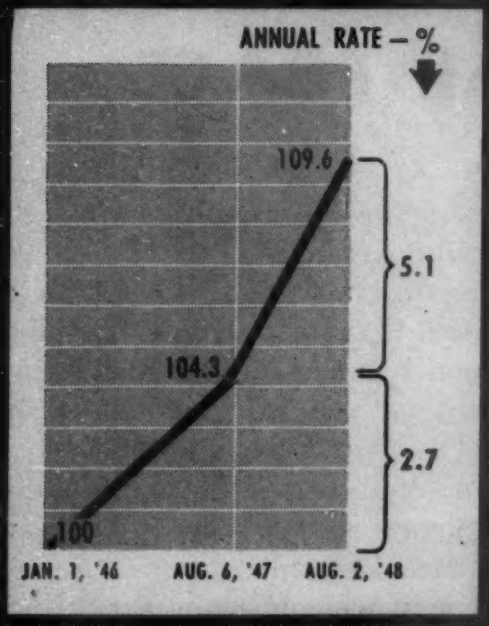
ALL MANUFACTURING



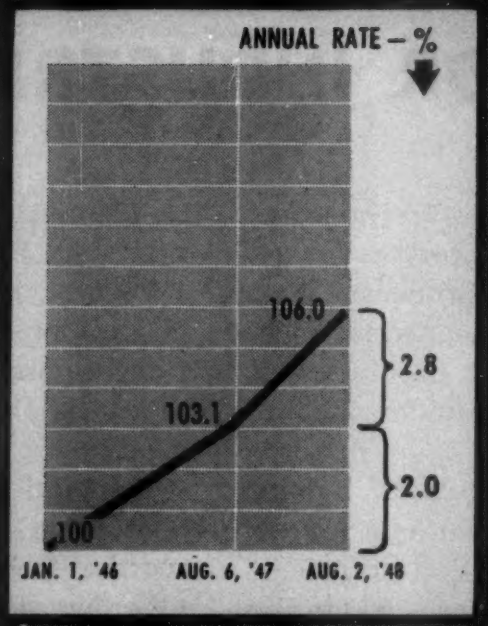
MACHINERY



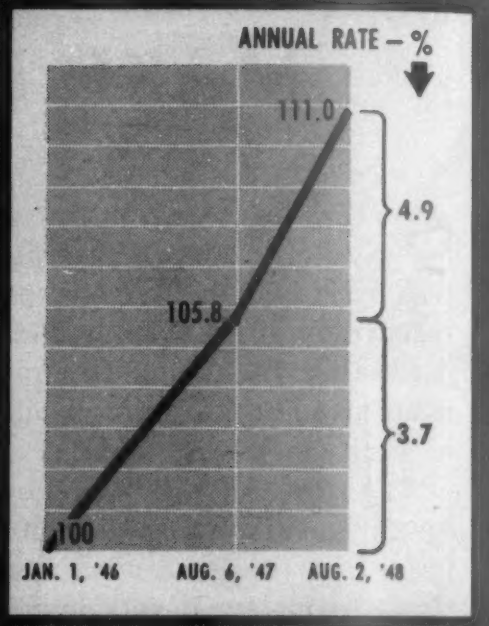
ELECTRICAL



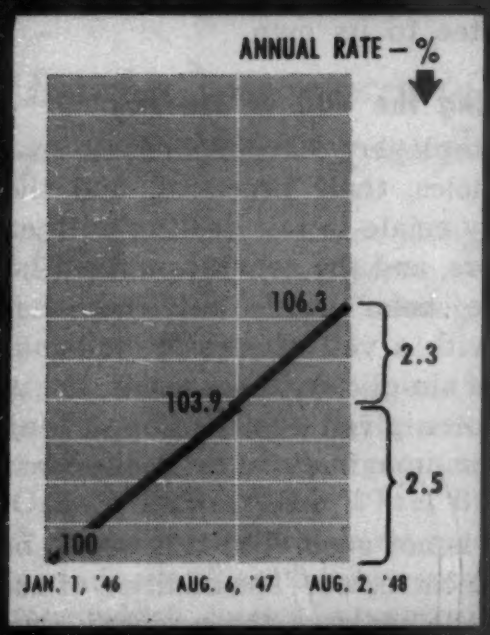
OTHER METAL



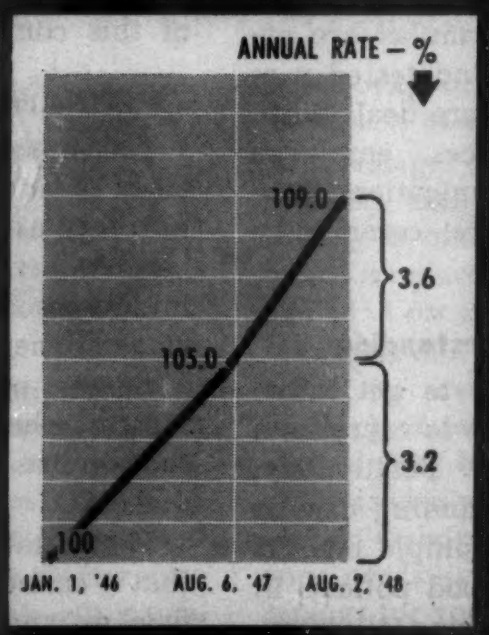
CHEMICAL, RUBBER



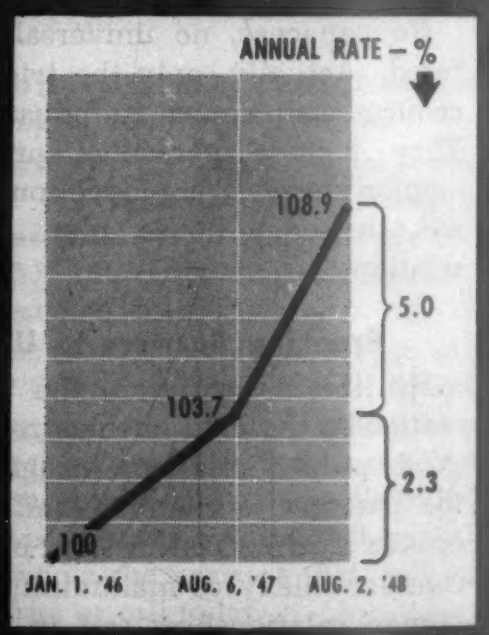
STONE, CLAY, GLASS



TEXTILE



WOOD, PAPER, PLASTICS



MISCELLANEOUS MFG.

HOW PRODUCTIVITY HAS GAINED: THE RECORD OF 2½ YEARS

PERIODS COVERED: JAN. 1, 1946, TO AUG. 6, 1947 (black lines in charts)
AUG. 6, 1947, TO AUG. 2, 1948 (red lines in charts)

WHAT'S HAPPENING TO PRODUCTIVITY

Last year, 447 plants with 1,070,420 employees told FACTORY that productivity had increased 3.3 per cent per year in the preceding 19 months

This year, 610 plants with 1,397,864 employees report an increase of 4.4 per cent during the year just ended

Three danger signs are disclosed in a generally favorable picture by FACTORY's second annual survey of wages and productivity in manufacturing

In FACTORY's survey, productivity for a given plant is determined by dividing dollar value of product, corrected for price changes, by total number of hours worked by wage earners.

PRODUCTIVITY is up for the second year running. And for the first time since the war, the *rate* of increase clearly exceeds the traditional "3 per cent per year" of the 1899-1939 period.

Replies from 610 companies with 1,397,864 employees (more than 10 per cent of total employment in the manufacturing industries) report productivity up 4.4 per cent in the year ended August 2, 1948. A year ago, 447 companies with 1,070,420 employees reported a gain of 5.3 per cent over a period of 19 months—a rate of 3.3 per cent per year.

Here, then, are the two most important facts about productivity disclosed by FACTORY's second annual survey of wages and productivity:

1. *Productivity is up—4.4 per cent in 12 months.*

2. *The rate of productivity increase is up—33 per cent faster than in the previous 19 months.*

But there are also some danger signs in this generally favorable picture. Three stand out:

1. Wage increases continue to exceed gains in productivity. Average increase in wages reported to FACTORY for the survey period was 9.7 per cent, more than double the increase in productivity. *This is a danger sign* because the only true source of higher wages is greater output (FACTORY, February, 1946).

2. Productivity did not rise as much as was expected. Respondents to last year's survey predicted a rise of 7.6 per cent in productivity during what was then the year ahead. The actual rise proved to be only 57 per cent as great as expected. *This is a danger sign* because manufacturing is a long-range business, and commitments—including wage rates—must be made on the basis of forecasts.

3. A substantial proportion of companies look to factors over which they have no direct influence to increase productivity in the year ahead. Again this year, FACTORY asked: *What one thing do you think will help most to increase productivity in the year ahead?* Twenty-one per cent gave answers FACTORY interprets as pessimistic. These answers were: Depression or scarcity of jobs; increased volume of production; greater availability of materials. In general those are factors over which management in the individual plant has relatively little control. *This is a danger sign* because there is a great deal that every company can do right within the plant gates to improve productivity.

Does industry recognize these danger signs?

There is no all-inclusive answer to that question. But analysis of the replies to FACTORY's survey indicates that the answer is more *yes* than *no.* These are some of the significant points:

1. FACTORY asked: *Do you believe that the level of productivity in your company is such that a further increase in productivity will justify a corresponding increase in wages?*

This year, 27 per cent said *yes,* compared with 33 per cent last year. That would seem to indicate a growing realization that wages have far outstripped the modest gains in productivity. Additional evidence is found in the fact that many *yes* answers were qualified by statements that further increases in wages must come only through use of incentives. Still more evidence: The largest pay increases have come in companies where the productivity gain was well in advance of the average. Twenty-six companies reported pay increases in excess of 20 per cent; average net gain in productivity for these companies was 8.8 per cent—double the general average. (*Note:* The wage increase in these companies was more than three times the average.)

2. Respondents were more cautious this year than last in predicting productivity gains. This was last year's record: Predicted increase, 7.6 per cent; actual increase, 4.4 per cent. Thus, despite the increase in the *rate* of productivity gain, estimates were more conservative this year, and predict a gain of only 5.5 per cent. But that 5.5 per cent represents a decrease in the *rate* of gain achieved in the past year. To avoid the danger of productivity stagnation, manufacturers

Q. HOW MUCH HAS PRODUCTIVITY CHANGED IN YOUR COMPANY SINCE AUG. 6, 19?

Within each industry group, first line is plants reporting increases, and average increase; second line, plants reporting "no change;" third line, plants reporting decreases and average decrease; fourth line, net change for group

SIZE OF COMPANY	1-100 EMPLOYEES		101-250		251-500		OVER 500		ALL COMPANIES	
INDUSTRY, No. EMPLOYEES REPRESENTED	NUMBER COMPANIES REPORTING	AVERAGE PER CENT CHANGE	NUMBER COMPANIES REPORTING	AVERAGE PER CENT CHANGE	NUMBER COMPANIES REPORTING	AVERAGE PER CENT CHANGE	NUMBER COMPANIES REPORTING	AVERAGE PER CENT CHANGE	NUMBER COMPANIES REPORTING	AVERAGE PER CENT CHANGE
MACHINERY	14	+11.4	5	+ 6.7	8	+ 9.3	10	+ 5.4	37	+8.7
177,959	9	NC	7	NC	2	NC	8	NC	26	NC
	4	−11.3	4	− 7.4	—	—	4	− 5.5	12	−8.1
	27	+ 4.2	16	+ 0.2	10	+ 7.5	22	+ 1.4	75	+3.0
ELECTRICAL	4	+17.7	12	+12.6	12	+ 5.7	24	+ 8.5	52	+9.5
334,514	5	NC	1	NC	5	NC	8	NC	19	NC
	3	−12.0	3	− 5.3	1	-- 3.0	4	− 5.1	11	−6.9
	12	+ 2.9	16	+ 8.4	18	+ 3.6	36	+ 5.1	82	+5.1
OTHER METAL	22	+13.8	22	+ 8.7	13	+13.6	57	+ 7.1	114	+9.4
335,505	7	NC	10	NC	12	NC	23	NC	52	NC
	4	4.1	5	10.0	1	-- 5.0	8	-- 7.0	18	−7.1
	33	+ 8.7	37	+ 3.8	26	+ 6.6	88	+ 3.9	184	+5.1
CHEMICAL, RUBBER	5	+ 7.4	3	+ 4.8	5	+ 9.0	18	+ 5.5	31	+6.3
208,471	3	NC	6	NC	3	NC	8	NC	20	NC
	1	−15.0	4	− 3.6	—	—	1	- 7.4	6	−6.2
	9	+ 2.4	13	0.0	8	+ 5.6	27	+ 3.4	57	+2.8
STONE, CLAY, GLASS	3	+10.3	3	+ 4.6	3	+ 6.5	11	+ 8.3	20	+7.8
48,628	2	NC	2	NC	—	NC	2	NC	6	NC
	—	—	—	—	1	- 5.0	1	−13.5	2	−9.3
	5	+ 6.2	5	+ 2.7	4	+ 3.7	14	+ 5.5	28	+4.9
TEXTILE	—	—	2	+ 2.7	2	+ 1.8	10	+ 6.5	14	+5.3
55,981	—	—	3	NC	4	NC	5	NC	12	NC
	—	—	1	- 5.0	—	—	2	- 1.6	3	−2.7
	—	—	6	+ 0.1	6	+ 0.6	17	+ 3.6	29	+2.3
WOOD, PAPER, PLASTICS	1	+ 5.0	9	+ 8.4	3	+ 5.2	9	+ 5.3	22	+6.6
45,013	3	NC	2	NC	2	NC	4	NC	11	NC
	1	- 4.0	—	—	1	- 0.5	1	9.7	3	−4.7
	5	+ 0.2	11	+ 6.9	6	+ 2.5	14	+ 2.7	36	+3.6
MISCELLANEOUS MANUFACTURING	15	+12.4	15	+11.3	19	+ 8.0	25	+ 8.0	74	+9.6
191,793	6	NC	6	NC	2	NC	16	NC	30	NC
	4	13.3	—	—	3	- 8.7	8	4.6	15	−7.7
	25	+ 5.3	21	+ 8.1	24	+ 5.3	49	+ 3.3	119	+5.0
ALL INDUSTRIES	64	+12.4	71	+ 9.2	65	+ 8.5	164	+ 7.1	364	+8.7
1,397,864	35	NC	37	NC	30	NC	74	NC	176	NC
	17	−10.0	17	- 6.8	7	- 5.7	29	- 5.8	70	−7.0
	116	+ 5.4	125	+ 4.3	102	+ 5.1	267	+ 3.7	610	+ 4.4

must not fail to achieve the goal they have set for themselves in the critical 12 months ahead.

3. Most companies reported that gains were made by reason of improvements within the plant. Except for "low volume of production," cited by some, most *decreases* have been the result of factors over which management can exercise control. It is encouraging that most companies look to future gains from in-plant factors. Worth noting, too, is the fact that a high proportion of the companies showing the largest gains, and predicting the largest increases, have long been reputed to be doing outstanding jobs.

Q. What factors have caused productivity to change in the past year?

A. Causes of increase	No. times mentioned
Better equipment and facilities	127
Improved factory methods	97
Incentives or bonus	62
Better-skilled labor force	55
Good management	55
Improved employee relations	32
Improved production planning, control	28
Training	17
Others	41

A. Causes of decrease	
Low volume of production	17
Labor, union troubles	16
High labor turnover	13
Others	9

ANALYSIS: (1) Comparison of the factors of increase with last year's list (covering January, 1946, through July, 1947) shows little change. The top six items remain the same, with minor changes in rank below first place. Improved production planning and control and training received too few mentions to be significant last year; although they did not displace the leaders, these factors showed marked increases.

(2) Comparison with last year's predictions of factors that would help most to increase productivity shows a complete agreement on the top five items. This is how the predictions lined up last year: Better equipment, 84 mentions; individual worker efficiency, 72; improved factory methods, 57; better management, 52; incentives, 50.

(3) The Taft-Hartley Act was mentioned only twice—once directly, once in connection with freedom from a secondary boycott.

• • •

"Post-war letdown" was last year's leading reason for productivity decreases; it didn't show up at all this year. Topping the list instead is "low volume of production"—in a year that broke all production records. It is notable that many companies do not know what caused productivity to drop, as evidenced by many failures to answer this question.

Q. What *one* thing will help most to increase productivity in the year ahead?

Factor	No. times mentioned
Better equipment and facilities	103
Incentives or bonus	67
Improved factory methods	63
Better management and supervision	61
Depression, scarcity of jobs	57
Worker attitude and efficiency	52
Increased volume of production	43
Improved labor relations	42
Availability of materials	22
Reduce prices, control inflation	16
Others	43

ANALYSIS: Outstanding here, perhaps, is the fact that a significant number of companies still consider "a depression," "difficult to get jobs," and even "bread lines" the *one* thing that will help most to increase productivity. Not mentioned last year, there is now a strong feeling that an even greater volume of production than at present will raise output per man-hour. Improved labor relations (with most respondents adopting a *positive* attitude) replaces last year's *negative* "reduce union influence." Enough companies mentioned "controlling inflation" to put it among the top ten, but four respondents (with incentive systems) suggested "higher prices to make men earn more by producing more."

Q. What is the relation between productivity gain and wage increases?

Change in Productivity (Aug., 1947, to Aug., 1948)	Average per cent change in productivity of group	Average per cent wage increase reported by group
Decrease (70 companies)	—7.0	9.5
No change (176 companies)	0.0	9.0
Increase under 10% (223 companies)	+4.2	9.7
Increase 10% or more (141 companies)	+15.2	10.7
All respondents	+4.4	9.7

ANALYSIS: There is some indication here that wage increases—most of them granted in the spring of this year—have reflected the trend of productivity change, which was pretty well apparent by the time the wage issue came up. It was not possible, of course, for companies to buck the general pattern and refuse any increases at all because of the lag in productivity. But it certainly appears that there was a greater willingness on the part of manufacturers to go along with wage demands when productivity was rising sharply.

CONTINUED ON NEXT PAGE

Q. What is the outlook for productivity gain and wage increases in year ahead?

Industry	WAGE RISE Aug., 1947 to Aug., 1948 (% increase)	PRODUCTIVITY RISE EXPECTED Aug., 1948 to Aug., 1949 (% increase)	WILL RISE IN PRODUCTIVITY JUSTIFY WAGE INCREASE? (% saying "yes")
Machinery	9.8	5.6	23
Electrical	10.7	5.9	32
Other Metal	9.1	6.1	27
Chemical, Rubber	8.9	3.9	38
Stone, Clay, Glass	10.1	5.2	19
Textile	10.8	4.0	15
Wood, Paper, Plastics	10.0	5.7	24
Miscellaneous	10.5	5.6	26
Plant Size			
1-100	10.5	6.5	34
101-250	9.0	5.9	31
251-500	10.8	5.6	26
Over 500	9.2	4.9	20
All Respondents	9.7	5.5	27

ANALYSIS: Probably because wages have pushed still further ahead of wages in the past year, only 27 per cent of the respondent companies believe a further increase in output per man-hours would justify a corresponding wage increase. This compares with 33 per cent of companies a year ago. However, a significant number of companies qualified their answers by saying that incentives accomplish this increase automatically where the gain is due to improved worker efficiency rather than better machines or new methods.

The outlook is fair-to-good: Manufacturers expect productivity to increase 5.5 per cent in the year ahead. That is less than was predicted for the past year (7.6 per cent), but more than the actual 1947-48 gain (4.4 per cent). However, it represents a slowing-up of the *rate* of increase in productivity gain. (Last year's 4.4 per cent was a 33 per cent increase; 5.5 in the year ahead would be only 25 per cent increase.)

Relative uniformity of prediction by industry is notable, from 3.9 to 6.1 per cent; last year the spread was from 1.6 per cent for textiles to 9.6 per cent for electrical.

Q. How did the actual gain in productivity compare with last year's predictions?

Industry	EXPECTED RISE Aug., 1947 to Aug., 1948 (from last year's survey)	ACTUAL RISE Aug., 1947 to Aug., 1948 (reported in this survey)
Machinery	6.9%	3.0%
Electrical	9.6	5.1
Other Metal	7.6	5.1
Chemical, Rubber	7.7	2.8
Stone, Clay, Glass	9.0	3.5
Textile	1.6	2.3
Wood, Paper, Plastics	7.5	3.6
Miscellaneous	7.8	5.2
Plant Size		
1-100	7.8	5.4
101-250	9.1	4.3
251-500	7.3	5.1
Over 500	6.7	3.7
All Respondents	7.6	4.4

ANALYSIS: Except in the textile industry, respondents to last year's survey displayed a mild over-optimism concerning the outlook for productivity increases. The actual net rise for all industry was only 57 per cent as great as predicted.

However, if the comparison is made on the basis of only those companies which responded to *both* surveys, a better correlation is found. These companies predicted a 5.1 per cent rise (compared with 7.6 per cent for all respondents last year), actually experienced a 4.2 per cent rise (compared with 4.4 per cent for all respondents this year).

Further analysis of companies that predicted gains of 20 per cent or more shows that while all but one fell short of the mark, their average actual increase was 12.1 per cent, almost three times the general average.

CONCLUSION: Productivity is up, 4.4 per cent in the year ended August 2, 1948. The *rate* of productivity gain is increasing, 33 per cent faster per year than in the 19 months ended in August, 1947. More companies are showing gains in productivity; 59.5 per cent this year reported increases, compared with 53.5 per cent a year ago. And while the percentage of companies reporting "no change" has remained static, those reporting decreases has fallen from 17.3 to 11.5 per cent.

Wages are still rising faster than productivity, although there is some improvement in this picture. Wages went up 9.7 per cent in the last year, productivity 4.4 per cent; in the preceding period the figures were 25.3 and 5.3 per cent, respectively. The result of such unequal increases, of course, is inflationary. Management has a job on its hands to stabilize the relationship of productivity and wages if inflation is to be controlled.

The important work of increasing productivity can be done right in the plant. The tools necessary to increase productivity are in the hands of management.

ANALYSIS OF SURVEY SAMPLE: Necessarily, the companies that responded to FACTORY's survey this year were not exactly the same companies that replied last year. Therefore, to check the validity of the composition of the sample, FACTORY made a separate analysis of the companies that replied to *both* surveys. This is what was found: 143 of last year's 447 respondents replied again this year. The net gain in productivity reported by these companies last year was 5.6 per cent (compared with an average of 5.3 per cent). This year, the gain reported by the control group was 4.2 per cent (compared with an average of 4.4 per cent). When the *cumulative* gain over the two periods is computed, the correlation is even better. The "repeaters" show a net gain of 10.0 per cent; the "all respondents" figure (combination of the two samples) is 9.9 per cent.

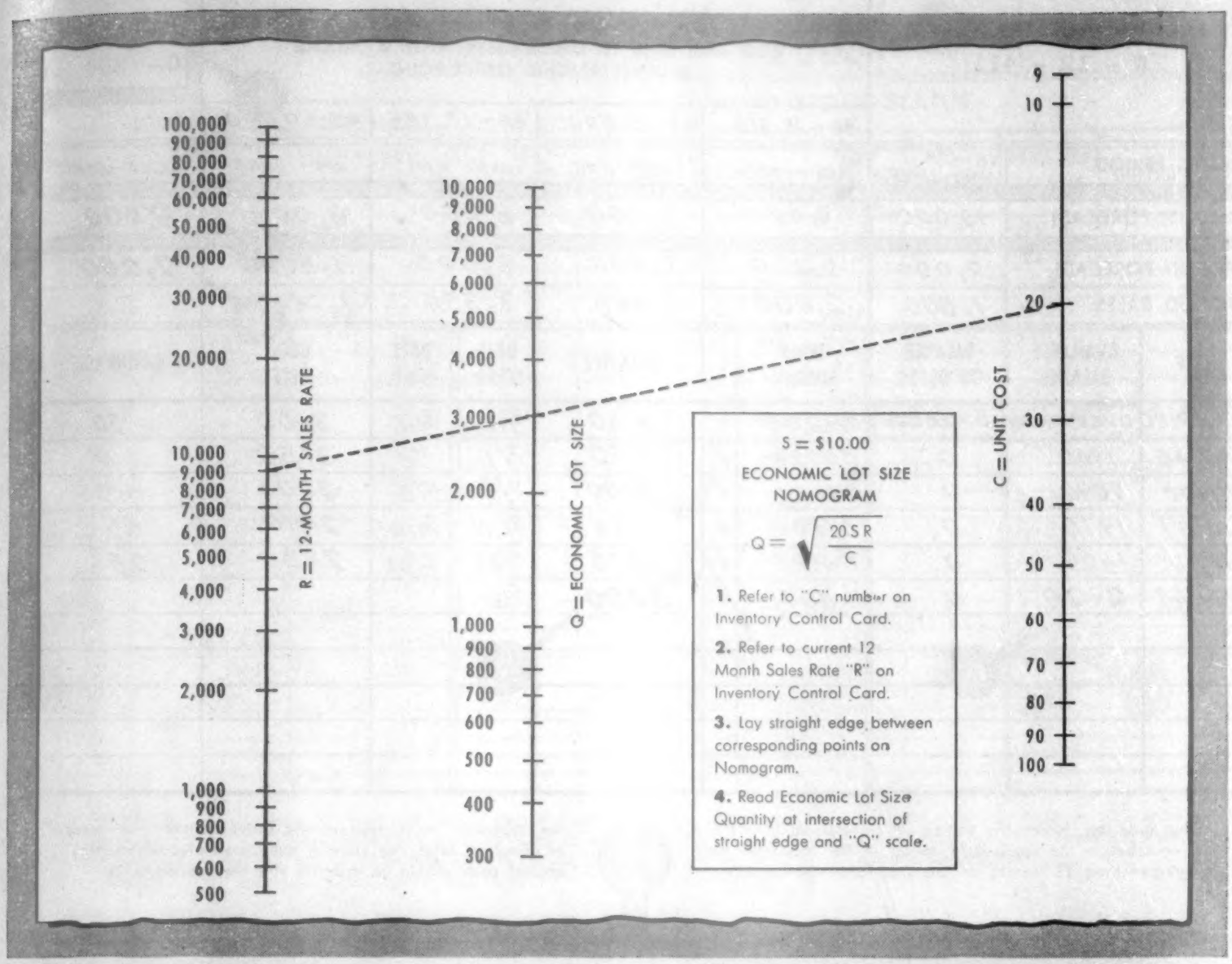


FIGURE 1. NOMOGRAM is means of quickly finding economic lot size. It eliminates tedious arithmetic calculations for each production order. Order clerk merely connects figures on outer scales with straightedge, then reads lot size from center scale. Set of nomograms was prepared for set-up costs in $1, $5, and $10 increments

HOW ONE COMPANY DETERMINES ECONOMIC LOT SIZES

Perhaps your plant can use this method of determining economic lot size. It saved money for Osborn

W. W. HANNON • SUPERVISOR, PRODUCTION AND INVENTORY CONTROL
OSBORN MANUFACTURING COMPANY, CLEVELAND

THE nomogram above, one of the series used by Osborn, has helped the company save 18 per cent on the combined cost of machine set-up cost and finished-stock carrying charges. It is the last step in a simplified, accurate method of determining economic lot sizes for production runs in this plant.

Formerly, size of stock orders for brooms and brushes was determined on an empirical basis. A maximum inventory level for each item was in use. It consisted of a 3-month reserve based on sales for a normal year. As the sales outlook changed, management made adjustments. A minimum-reserve was established as a cushion against abnormal sales. Order quantities were not reckoned in terms of breakeven points for inventory carrying charges and set-up costs.

From detailed studies we found these factors affected economic lot size: (1) Set-up and order entry cost; (2) sales forecast; (3) manufacturing cost per piece; and (4) a carrying factor to cover interest charges, space rental, and overhead. The accuracy with which

W - 12 - 411

TRAVELING REQUISITION

POST AND SEND TO ORDER CLERK WHEN AVAILABLE BALANCE REACHES ORDER POINT

S— $10.
C— 20¢

		'42 - 16,315	'43 - 15,500	'44 - 17,385	'45 - 9,000	'46
SALES PERIOD	'46 APRIL - JUNE	'46 JULY - SEPT.	'46 OCT - DEC.	'47 JAN - MAR.	'47 APR - JUNE	'47 JULY - SEPT.
12 MO. FORECAST	10,000	9,000	8,000	8,000	8,000	9,000
PERIOD FORECAST	2,000	2,200	2,500	2,000	1,500	2,200
PERIOD SALES	1,800	2,000	2,485	2,330	1,780	

I — II — III

DATE	AVAILABLE BALANCE	BALANCE ON ORDER	ORDER NUMBER		QUANTITY	DATE SCHED	DATE COMP.	GOOD PIECES	SHRINKAGE
CARRIED OVER FROM OTHERSIDE			D1283		3150	3/12	3/10	3100	50
5/22/46	1965	0	D5225	✓	3150	7/7	7/8	3150	0
9/15/46	2090	0	D9151	✓	3000	11/1	11/3	3005	-5
1/10/47	1970	0	D1106	✓	2875	2/10	2/14	2810	65
4/19/47	1405	0	D4193	✓	2875	5/28	5/22	2850	25
7/28/47	2120	0	D8071	✓	3000	9/21			

IV — V

When ordering, follow the nomogram corresponding to the "S" number in the upper-right corner. If the economic lot is greater than 12 months or less than one month's sales the supervisor must approve the order quantity. In cases of abnormal sales, the quantity overdrawn plus two months' normal sales should be ordered plus the economic lot.

FIGURE 2. TRAVELING REQUISITION supplies data for finding economic lot size from nomograph (Figure 1). Quarterly sales forecast (III) in order point. S (I) is set-up and order-entry cost for producing a run; C is cost per unit. Only other figure needed to find economic lot is 12-month sales forecast (II). Order clerk gets requisition when stock level (IV on Figures 2 and 3) drops below order point. Economic lot size is designated by V and is entered after it is determined from nomogram. Number of items produced may vary slightly

any other factors could be calculated in our operations did not warrant attention.

We based our system on the formula $Q = \sqrt{\frac{2SR}{CI}}$

Where Q = economic lot size (rounded off within 5 per cent)
S = set-up and order entry cost (rounded off to the nearest $5)
R = yearly sales forecast adjusted quarterly
C = manufacturing cost per piece
I = an inventory factor—10 per cent is used to cover interest charges, space rental, and applicable overhead.

Arithmetic calculation of economic lot size (by means of the formula) for each item produced proved too unwieldy. A nomographic solution was resorted to. It provided the most rapid and easily taught method of calculation. For the purpose of further simplification and accuracy, inclusion of a set-up cost scale and the necessary transfer line on one nomogram was ruled out in favor of a set of nomograms indexed by set-up cost.

To prove that economic lot determination was profitable, we made a survey of shop orders for several types of brushes issued over the previous year. Sixty per cent of production orders placed were for quantities within 10 per cent of economic lot size. Twenty-nine per cent of the orders were for smaller quantities. This abnormally increased set-up cost. Eleven per cent were for larger quantities. This abnormally increased inventory-carrying charges.

On this 40 per cent of the orders, an 18 per cent combined cost reduction is being effected.

We wanted our finished stock inventory to consist of a fairly stable 6-week cushion (safety factor), plus a fluctuating quantity governed by the rate of consumption of an economic lot. A 6-week cushion requires that a dollar allocation be made to insure that there will be an adequate supply during abnormal sales periods. The cost of carrying an economic lot in inventory is offset by the saving in set-up cost and handling charges.

The maintenance of an adequate inventory is not such a problem when the costs related to the size of the run balance each other. This leaves only the carrying charges

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PERIOD	'47 APRIL-JUNE	'47 JULY-SEPT.			
ORDER POINT	1500	2200			

FINISHED STOCK STATUS

DATE 1947	SOLD	TOTAL SALES BY MONTH	PRO-DUCED	AVAILABLE BALANCE	SHIPPED	ACTUAL BALANCE	DATE 1947	SOLD	TOTAL SALES BY MONTH	PRO-DUCED	AVAILABLE BALANCE	SHIPPED	ACTUAL BALANCE
4-6	——	0	——	1815		2150	6/9	——	110	——	3515		3650
4-6	50			1765			6/9	100	210		3415		
7	100	150		1665			11	80	290		3335		
12	70	220		1595			14	110	400		3225		
16	60	280		1535			15	40	440		3185		
19	130	410		1405			19	60	500		3125		
25	20	430		1385			24	50	550		3075		
26	40	470		1345			25	140	690		2935		
30	40	510		1305	735	1415	26	40	730		2895		
5-3	70			1235			30					640	3110
10	30	100		1205			7/1	210			2685		
11	105	205		1100			7	60	270		2625		
18	100	305		1000			16	115	385		2510		
20	90	395		910			22	190	575		2320		
22			2850	3760		4265	23	80	655		2240		
26	75	470		3695			28	120	775		2120		
27	70	540		3625			31					945	2265
31					615	3550	8/2	165			1955		
6-1	60			3565			7	200	365		1755		
5	*50	110		3515			13	*95	660		1660		

ABNORMAL IF ABOVE: 300

Jn cases of abnormal sales, consult supervisor before allocating stock on hand to an order, as it may be advisable to handle the order as special rather than stock.

ABNORMAL IF ABOVE: 300

Compare available balance with order point. and prepare traveling requisition when order point is reached.

FIGURE 3. FINISHED-STOCK CARD. Allocations are made on this form to satisfy sales. When available balance drops below order point for quarter (III), balance is underlined. Traveling requisition is sent to order clerk who writes production order. Actual balances are disregarded in determining order point. All action is based upon units allocated. When order is placed, requisition is returned for filing until order has been produced. Proper information is then noted on both cards and they are filed until order point is reached again

on the safety factor to be written off in customer satisfaction.

Orders are placed when the inventory reaches a point equivalent to the quantity which could normally be sold during the processing period, plus the quantity required for the minimum bank.

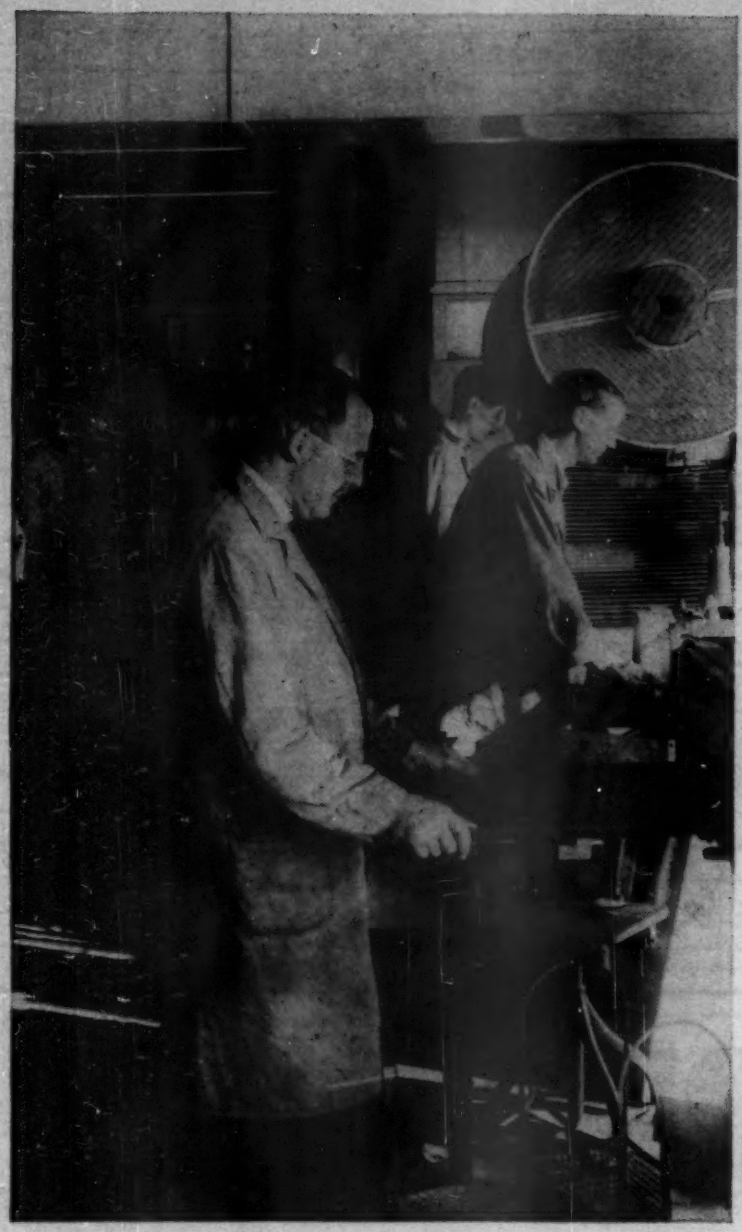
Refer to Figure 2. At the beginning of each quarter, sales for the next 12 months are forecast (II). This becomes the 12-month forecast (R) used for economic lot calculations during the quarter. In addition to forecasting for the full 12-month period, a quarterly forecast (III) is made.

The quarterly forecast (III) becomes the order point. This is twice the minimum reserve required. It provides for a 6-week manufacturing cycle which allows the new order to arrive in stock when the minimum reserve stock balance has been reached. This order point is then listed under the appropriate period at the top of Figure 3.

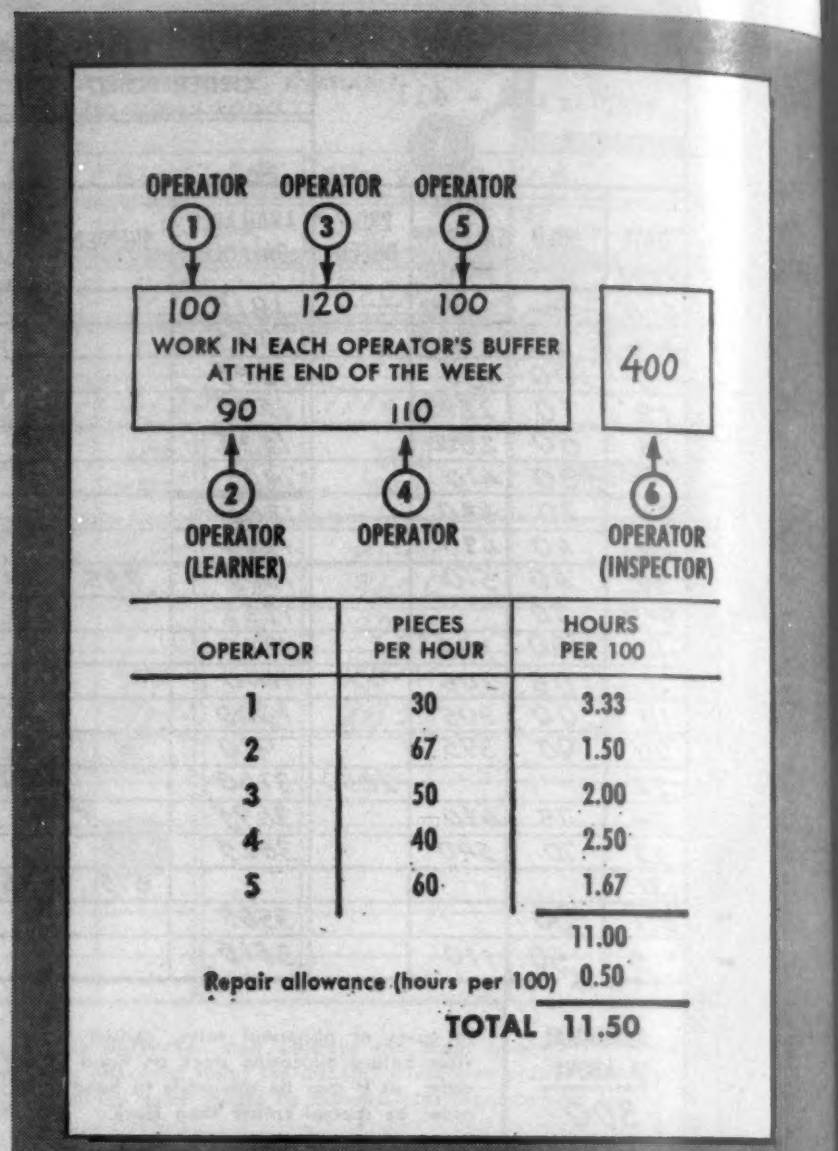
As brushes are sold, quantities are listed by date both individually and cumulatively by months. Daily sales figures are subtracted from the available balance, even though immediate shipment may not be indicated. When an individual sale brings the available balance below the order point, a line is drawn under the balance (IV) on Figure 3.

Let's consider an example. As noted from Figure 3, on July 28 the available balance of brush No. W-12-411 had fallen below the 2200 order point for the quarter, July to September, 1947. The order clerk was sent the traveling requisition (Figure 2) for the item. She determined the set-up cost, S number (in this case $10) from Figure 2, and procured the corresponding nomogram (Figure 1). She then checked the C number (manufacturing cost in cents per brush) and the R number (12 months' sales forecast) on the traveling requisition card (Figure 2). For brush W-12-411, C = 20 cents, and R = 9000 (July to September, 1947 12-month forecast). By laying a straightedge on Figure 1, from 20 on the C scale to 9000 on the R scale, the clerk determined the economic lot size by merely reading off the number where the straightedge crossed the Q scale—in this case, 3000 brushes. An order was issued (D 8071, dated July 28, Figure 2) covering this quantity.

As may be seen from the above calculations, the economic lot size must be recalculated every three months, because it is determined from a changing quarterly 12-month sales forecast.



Bonus for this group is determined . . .



OPERATOR	PIECES PER HOUR	HOURS PER 100
1	30	3.33
2	67	1.50
3	50	2.00
4	40	2.50
5	60	1.67
		11.00
Repair allowance (hours per 100)		0.50
TOTAL		11.50

TABLE 1

by counting work in buffers and rating output . . .

BRITISH FIRM STIMULATES OUTPUT

A PLANT-WIDE experiment in the use of group incentives is now under way in the Perivale, England, plant of Hoover, Limited.

While not minimizing the administrative difficulties involved in broad application of group incentives, Hoover believes that the system offers one outstanding advantage, over any other method:

With group incentives, the worker becomes part of a personalized team; he is no longer a nameless cog in a production machine, and he has the added stimulus of team spirit.

Apart from the mechanics of the wage calculation, Hoover has discovered two "musts" for successful operation of a group system:

1. *Good leadership* of each group is a primary essential. Since whether or not the group will work efficiently and in harmony depends largely on this one man, he must be carefully selected and be given considerable responsibility. He must be able to advise, check workers' earnings, and maintain the team spirit in his group, in addition to his normal supervisory duties.

2. *Small groups* are best. Production should be planned to this end and, in general, groups should not exceed 15 operators. The various operations in a group set-up should be interdependent.

From a practical point of view, and aside from the psychological value of group working, probably the chief advantage obtained by Hoover has been the reduction in checking and counting of work. Instead of checking at each machine, and computing each individual's bonus earnings, checking is required only on the work buffers at the machines, the bonus being figured for the group as a whole.

The manner in which this process is carried out at Hoover is shown in the tables above.

In the case illustrated, there are are five operators and an inspector in the group. To make this theoretical example complete, it is assumed that operator No. 2 is a learner.

Under the group system, it is clear that some allowance must be made in order to prevent the learner's lower output from penalizing the group as a whole. The learner

At the Beginning of the Week
Work standing in buffers represented.... 65 hours

At the End of the Week

The operations are in sequence. Therefore, the work left in the first buffer will be paid for only on the time rate for that operation, i.e., 3.33 hours per hundred. The second buffer, however, represents two completed operations and is, therefore, assessed on a rate compounded of the sum of the first and second operations, i.e., 3.33 + 1.5 hours per 100, giving a rate of 4.83, and so on. Thus, the time allowed for the buffer at the end of the week is calculated as follows:

OPERATOR	WORK BUFFER (Hours per 100)	TIME ALLOWED (Hours)
1	100 at 3.33	3.3
2	90 at (3.33 + 1.5)	4.3
3	120 at (3.33 + 1.5 + 2.0)	8.2
4	110 at (3.33 + 1.5 + 2.0 + 2.5)	10.3
5	100 at (3.33 + 1.5 + 2.0 + 2.5 + 1.67)	11.0
		37.1
6	(Completed Work) 400 at 11.5	46.0
	Hours allowed for buffer at end of week	83.1

TABLE 2

	HOURS
Rated weekly output of group, 2,500 at 11.5 hrs. per 100	287.5
Deduct for learner's rated time	37.5
	250.0
Deduct for work standing in buffers at the beginning of the week	65.0
	185.0
Add for work in buffers at the end of the week	83.1
TOTAL RATED TIME	268.1

Time taken by operators 1, 3, 4 and 5 (the learner is excluded, being scaled individually to receive 125 percent)

OPERATOR	HOURS
1	44
3	44
4	35
5	43
TOTAL TIME TAKEN	166

Time ratio:

$$\frac{\text{Time allowed}}{\text{Time taken}} = \frac{268.1 \text{ hours}}{166.0 \text{ hours}} = 1.62$$

The bonus earnings therefore are 62 percent of the flat rate.

TABLE 3

to figure time allowance for buffers . . . **from which weekly wage computation is made**

WITH GROUP BONUS

is, therefore, treated individually, and is automatically paid a 25 per cent bonus during the training period.

Table 1 lists the time standards for each operation, and shows how the group time standard is determined. Also entered on the form is the number of pieces standing in the work buffers (in-process inventory) at each operation at the end of the week.

A computation is then made to determine the equivalent, in hours, of the work standing in the buffers. This computation is shown in Table 2. Because the work in the several buffers is at different stages of completion, it represents a different number of hours of work in each case. However, once the formula has been established, it is a matter of simple multiplication to determine the *total* number of hours of work represented in the buffers at the end of the week. The figures entered for work in buffers at the *beginning* of the week, obviously, is the same as the *end of week* figure for the preceding period.

Calculating the Wage

In making the wage calculation (Table 3), it is necessary to adjust the rated or allowed time to account for the learner and for the work in the buffers before comparing it with the actual time.

If the other workers in the group are not to be penalized, the rated time for the operation being performed by the learner must be deducted from the total rated time of the group. Work in buffers at the beginning of the week must be deducted since it represents work already completed and paid for in the previous week. Work in the buffers at the end of the week represents work completed, and the time allowed for this work must be added to arrive at the *net* rated time for work completed during the week.

That the comparison be on a fair basis, the actual time is computed by adding only the times for the regular operators. Thus, in the example shown, the ratio of allowed to actual time is 1.62, and each of the four regular operators in the group will be paid a bonus of 62 per cent in addition to the flat rate for the week. The learner's bonus, automatically, is 25 per cent.

1 Department foreman and methods engineer get together to discuss a job that needs improvement. Studying a skilled operator at her workplace, they find that the job is unbalanced—one hand is doing too much holding

JOB IMPROVEMENT IN TWELVE STEPS

Here, fully illustrated, is a simple plan for avoiding mistakes while processing job improvements

J. J. EDWARDS • GENERAL METHODS ENGINEER, OLDSMOBILE DIVISION GENERAL MOTORS CORPORATION, LANSING, MICH.

PLANNING of operator methods has been systematized and made a definite part of the manufacturing job at Oldsmobile. And a step-by-step procedure has been worked out which brings everyone concerned into the picture when and as needed.

To make this approach possible, the methods department has been subdivided into three major groups:

1. Current methods section, responsible for the improvement of work in production.

2. Development methods section, responsible for all long-range job improvement planning.

3. Plant layout section, responsible for the arrangement and location of all facilities required for production.

These three groups are interrelated and are supervised by the general methods engineer. Each group has access to, and can use, facilities of the entire department.

A small area in the methods department has been set aside for experimental and research purposes.

JOB IMPROVEMENT IN TWELVE STEPS . . . continued

2 Still studying experienced operators, the engineer makes an act or sequence chart of the present method. All job requirements, together with quality and quantity standards are listed in detail for later reference

3 Micro-motion studies are also made of job, and film is spliced to form continuous loop. The engineer has an easy time making notes during his analysis because the hooded screen enables him to view the film in full light

This section is known as "the methods laboratory." Facilities provided in the laboratory include inexpensive benches, hoppers, slides, rails, hooks, hangers, and air drops. All are available for "mocking-up" and "dummying-up" of new methods, which are given a trial run in the laboratory in order to work out all the errors before the job is installed on the production floor. Many times, ways are found to improve what was thought to be the best method before the trial run was made in the laboratory.

The methods department also utilizes the micro-motion camera for making detailed job studies. These studies are developed on loop film for analysis in the methods laboratory. Film can be projected at normal working speed, at slow speed, or frame-by-frame. Other tools used by the methods group include act breakdown chart, process flow chart, and operator training sheets.

Oldsmobile believes that education and training in better methods are also important factors. A program was completed where a series of 18 sessions was given for 1100 plant and office supervisors and planning people. These 1¼-hour conferences were held once a week, and were designed for group participation. The interest of the group was stimulated through the use of shop problems, illustrations, moving pictures, and other visual aids. A booklet entitled "Oldsmobile-Methods Engineering" was designed to stimulate still further the interest of supervision. The book was made interesting to read by including a large number of illustrations, and by writing it in a light and non-technical style.

Shown on this page and the pages that follow is a series of photographs illustrating the step-by-step procedure followed by the methods department in improving a job.

A simple example was chosen to allow concentration on the sequence of job improvement rather than the sequence of assembly. The job picked is the assembly of a bolt and washer that is used on the periphery of the transmission flywheel cover. There are 30 of these assemblies used for each engine built and, therefore, hourly requirements are high. The improvements shown here resulted in a 100 per cent increase in production per man-hour.

CONTINUED ON NEXT PAGE

4 After the paper analysis has been completed, the engineers on the job work out a tentative "better method." A dummy or mock-up is then produced in the laboratory to permit experimentation and further improvement

5 Supervisor reviews new method. Any other departments affected by the change are consulted at this stage

6 Foreman, who has been consulted during development, is called in to give final approval to new method

10 Operator training sheet (arrow) provides complete directions, remains with workplace to back up instruction previously given the worker by the foreman.

11 A methods engineer (above) drops in on the operation to see if "bugs" have developed that might prevent the new arrangement from functioning as planned

7 Layout men and methods engineers discuss changes in facilities required to permit installation of new method in plant. Scale models of the new workplace (in this case there is no additional equipment) form basis for talks

8 After plan is set, methods department builds workplace exactly as it will be on production floor

9 Final pre-production step is to review new set-up with plant superintendent, plan actual transition

12 Last of the twelve steps in the job improvement plan is for the time study man to check the job and set the new rate. When this rate has been approved and placed in effect, the process is complete. Simple as it was, the improvement illustrated resulted in a 100 per cent increase in production per man-hour for the operation

TYPICAL of the many subassemblies is the line for production of under-car frames. Similar lines have been established for roofs, sides, ends, and doors. Result is a standardized product at far lower unit cost

LINE ASSEMBLY PAYS OFF IN HEAVY

Mass methods and standardization of product pay off handsomely when applied to production of boxcars

A. A. LOGMANN • MANAGER OF WORKS, PULLMAN-STANDARD CAR MANUFACTURING COMPANY, MICHIGAN CITY, IND.

EVERY two months, Pullman-Standard now produces 265 more freightcars than previously, and with no increase in the total cost of production (labor plus materials plus overhead).

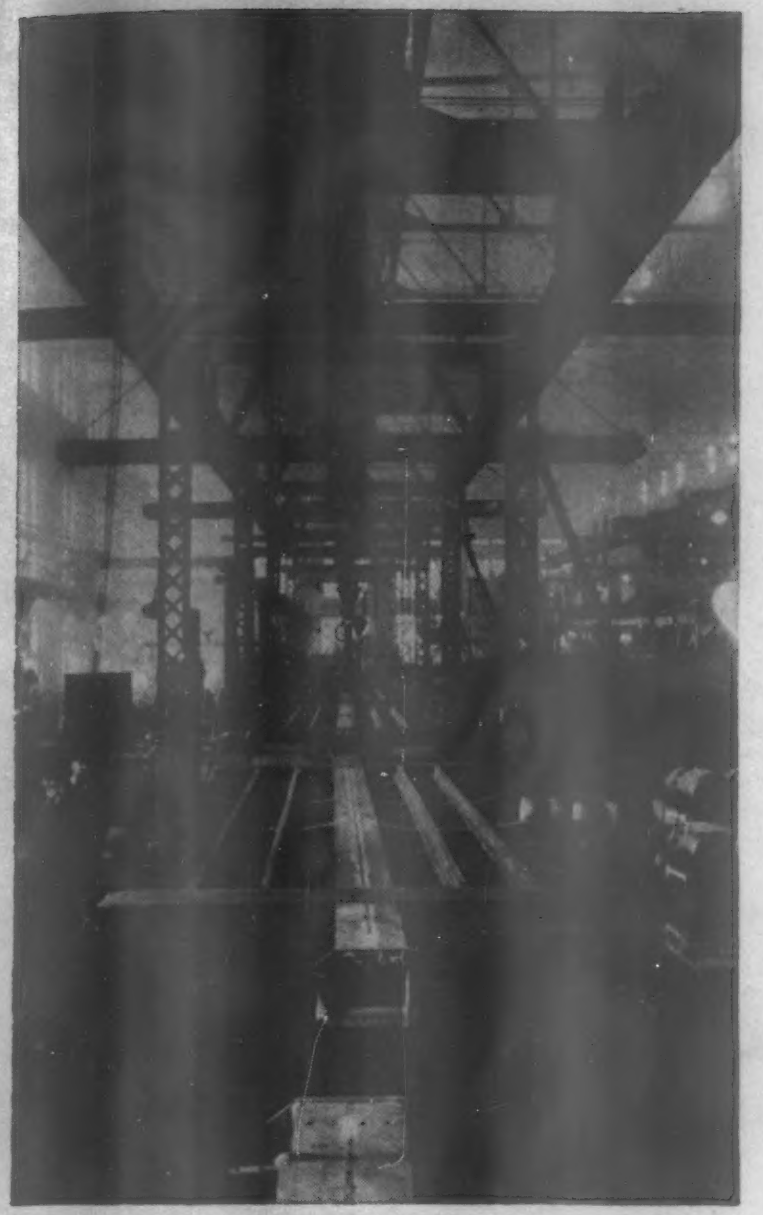
A car every 10 minutes was the objective of the new program, and the objective is being met. Mass production techniques applied both to fabrication and to assembly, plus standardization of product witl the introduction of interchangeable parts, have been the largest contributing factors.

Under the old system, orders from the various railroads varied greatly as to design specifications and painting requirements. The result was a 2- to 5-day shutdown for each change-over from one order to the next. Not only was there a serious loss in production, but also workers were subject to periodic layoffs

To overcome these difficulties, separate fabricating and assembly lines were set up for under-car frames, car sides, ends, roofs, and side doors. Each of these sub-lines feeds into the master assembly line where the subassembly is required.

Actual sequence of operations on the final assembly line is as follows: (1) Attach under-car frame to trucks, after which assembly moves on its own wheels; (2) assemble sides to under-car frame; (3) place car ends in position; (4) attach side doors; and (5) drop roof in place. After the final touch-up, including welding and riveting, the completed boxcar is pulled by switch engine to the paint shops.

Basically there is nothing new in the principle of standard design and the mass production techniques adopted by Pullman-



TRUCKS are assembled to under-car frames at earliest possible moment, permitting easy travel along line

PRE-ASSEMBLED sides, ends, and doors are swung into position by overhead hoist to cut time and effort

INDUSTRY

Standard. Their effectiveness has been known and demonstrated for many years in the lighter manufacturing industries; their applicability to heavy industry has also been known but less widely demonstrated. The experience of Pullman-Standard offers additional evidence.

The result of the program has been fourfold:

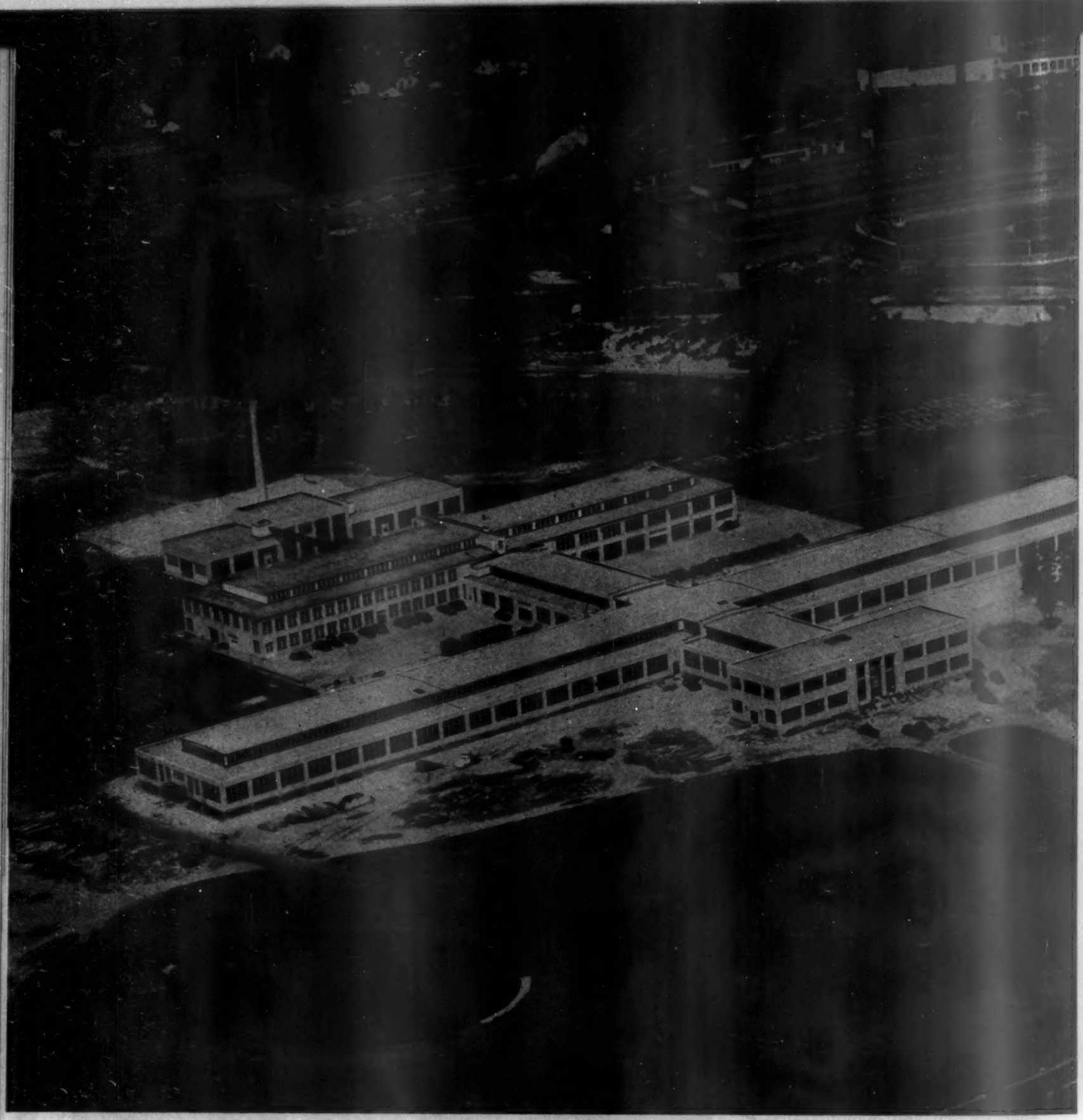
1. Better utilization of manpower —shorter training periods, easier work, no layoffs.

2. Better utilization of facilities— less waste area, no downtime for change-overs.

3. Increased production—265 more cars every two months.

4. Lower unit costs—no added outlay for the added production.

LAST OPERATION is welding and riveting. After roofs have been dropped in place, assembly is made permanent, then pulled by engine to paint shop



ABOVE GROUND. Smith & Wesson's new plant is a modern, sturdy building of open-court design. That means protection from bomb concussion. Sidewalls slide up for ventilation, and to protect interior by blow

FOR THIS NEW PLANT . . .

READY to move underground in case of an emergency is Smith & Wesson, small arms manufacturer.

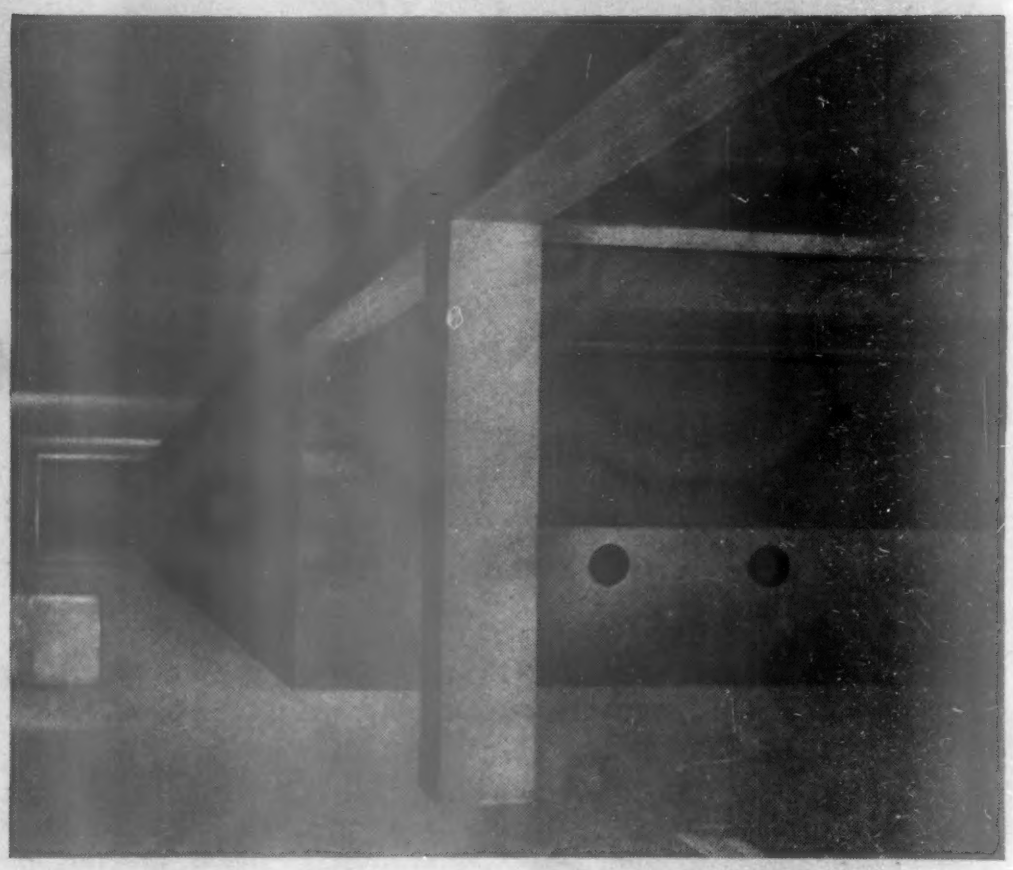
The company's new plant, located a few miles from Springfield, Mass., looks to the casual observer not unlike many another modern industrial building. What makes it different is the network of underground tunnels and vaults beneath the main structure. A duplicate set of all plant service facilities guarantees full production of S & W's war-vital guns even in the event of severe bomb damage to the above-ground structure.

Tunnels are 15 feet wide, have walls of steel-reinforced concrete several feet thick. In peacetime, they will be used for intraplant transportation to relieve congestion in production areas. Subterranean chambers are arranged to permit rapid transfer of production machines from above, will provide storage space in the meantime.

Because S & W will be able to utilize the space immediately, the cost of the underground structure did not run the over-all plant cost

ing outward in case of blast. But the important features are underground

TUNNELS offer air shelter, will be used for intraplant transportation in peace to avoid congestion in the factory areas above



BELOW GROUND are chambers to which production machines can be moved. They will pay their way as storerooms during peacetime

. . . UNDERGROUND QUARTERS

out of line. Far from it. Total construction cost was only about $6 per square foot.

Protection of personnel was given prime consideration. Strategically located stairwells make it possible to get all plant personnel into the tunnel system in less than a minute. The tunnels can be sealed against gas attack as well as fire.

Other safety factors include: (1) Dual steam-main distribution; (2) dual communication lines; (3) self-draining sump pits for underground areas; (4) strategically located valve and control stations; and (5) high-pressure boilers (normally only low-pressure will be required, but the high-pressure, capable of 800 horsepower will be available).

The above-ground structure is similarly planned to withstand attack. Buildings are not in straight-line arrangement (less vulnerability to bombing run). Open court minimizes shock from bomb explosions. Sidewalls slide up to provide air circulation; would blow out in event of explosion, thereby reduce damage to plant.

STUDENT TEAM meets the author, a vice-president of Spalding, to get over-all picture of the company operations they will study in detail during this and five subsequent full-day visits. On final trip, they will return

COMPANY GAINS WHEN STUDENTS

Cooperative projects result in reports valuable to company as well as in giving students a "feel" of industry

WILLIAM T. BROWN • VICE-PRESIDENT IN CHARGE OF PRODUCTION, A. G. SPALDING & BROS., INC., CHICOPEE, MASS.

IT IS A chronic complaint with business men that college graduates have to *unlearn* everything they have learned in the classroom before they are of any use to a company. Spalding is proud to be one of a number of companies associated with the Massachusetts Institute of Technology in a program aimed at reducing if not eliminating this complaint.

For many years, certain colleges and universities have been offering "full dress" cooperative courses, but by and large this type of training has been available to only a very limited number of men each year, and seems likely to remain so. To most college students, the only opportunity to get a "feel" of industry has been an occasional plant visit or field trip, which usually occupies no more than a single afternoon. The result, most of the time, is that the student goes away with only a vague general impression of the company, and without the slightest conception of "how" it functions, or "why" it does certain things the way it does.

Beginning in 1946, the Department of Business and Engineering Administration at MIT developed a program to bridge this gap between academic training and industrial experience, whereby all the seniors in that course would have an opportunity to make an intensive study of at least one industrial concern.

Although the procedure has been varied slightly to meet the specific requirements of each of the 26 firms that have thus far cooperated in the project, I believe the experience of Spalding is typical.

Following the initial approach, we assigned our methods engineer to collaborate in planning the details of the project. According to a prearranged schedule, five seniors spent six full working days at our Chicopee, Mass., plant over a period of approximately six weeks. We agreed to make available to these students whatever information might be required for them to produce a thorough reportorial account of our company's operations and an analytical study of whether or not our practices agreed with the classroom theories currently being taught. The report was to cover six broad topics as follows:

1. Sales and merchandising.
2. Finance and cost accounting.
3. Manpower and labor relations.
4. Product engineering and process engineering.
5. Production administration.
6. Purchasing.

At the time we agreed to participate in this project two important questions quite naturally arose in our minds.

Would the presence of this group

here to discuss their findings and the report that they will prepare

INTIMATE PROBLEMS of plant operation are studied in every department. To cover more ground, students work individually or in pairs

ANALYZE FACTORY OPERATIONS

of students over so long a period interfere with our normal operations? Experience proved the answer to be a very definite *no.*

Of what practical value would the visits and the resulting report be to the company?

1. The report, which filled four loose-leaf notebooks, gave Spalding executives an opportunity to reappraise the company's organization and operations from the point of view of an outsider. Indirectly, we had an opportunity to answer for ourselves the question, "Are our procedures sufficiently simple and straightforward to be understood by men of college level?" It seems obvious to me that this should be the case. I am also of the opinion that the report could have been of much more functional value to us, by way of suggesting both specific and general improvements, had we not just completed a thorough internal reorganization because of our reconversion from war to peace manufacture. Evidence coming to me from other companies that have cooperated in this project suggests that there is frequently considerable value to be obtained from the student's analyses in this way.

2. At the time the visit was made, we were contemplating courses, which we have since conducted ourselves, for our own salesmen and employees. Both the visits of the students and their final study were of great benefit to us in formulating

"ON THEIR OWN" after first visit, students move from one department to another, asking questions, collecting information for a four-volume report

the program for our own training activities.

3. We have used a condensation of the report as a means of giving visitors to our plant—mostly dealer-customers—a general picture of our methods of manufacturing and operation.

From a long-range point of view, there is still another advantage to be obtained from this type of work. Men who have had this type of training will be better workers and better potential members of the management team when they leave school and enter positions in industry. Until many more colleges and many more companies adopt this type of cooperative program, I admit there is small chance that many companies will be able to benefit directly by hiring men with this type of training. But if industry will accept the challenge—and it *is* a challenge—it may not be too long before many, rather than a mere handful, of our college graduates are thus better equipped to enter upon industrial careers.

Certain reactions to the Spalding-MIT program, based on our experience, might be of interest to other companies wishing to consider cooperation with colleges and universities in similiar student-industry projects:

First visit. On the first visit, the team operates as a group. It is desirable for some person with a broad knowledge of the company to spend a good deal of time telling them the general plan of the company's operation. He should also introduce them to department or division heads, who will outline the somewhat more specialized functions and problems of their sections. This first visit should probably be rather carefully planned.

Subsequent visits. At later times, the students operate strictly "on their own," either as individuals or in pairs. After checking with the executive in charge of the program, they are given the freedom of the plant to talk with whom they wish. If, for example, after talking with the production control supervisor, the student wishes to follow a problem into the drop forge, the supervisor will introduce him to the forge foreman. By proceeding in this manner, the visits occupy only small part of any one man's time.

Dissemination of report. Two copies of the full report are prepared. One is submitted to the professor in charge, the other is delivered to the designated executive of the participating company. The report is then edited to make impossible identification of the company or its personnel. Duplicated copies of this edited report are then made available to all students in the course, and for reference by future students.

Repeat visits. To date, only one student team has visited Spalding. Some of the cooperating companies, however, have already received calls by second groups. Because the students on the second visit have the advantage of studying the previous report *before* their call, the program does not represent tiresome repetition. Rather, the students come properly equipped to enter into intelligent—and, to the company, valuable—discussions of detailed and sometimes complex working problems.

★ ★ ★

By getting in touch with nearby colleges and arranging programs of this type, industry has an opportunity to do a great service not only for the youth of the nation, but also for itself.

OIL VS. COAL FOR INDUSTRIAL STEAM PLANTS

DAVID MOFFAT MYERS • MYERS, FULLER & ADDINGTON
NEW YORK

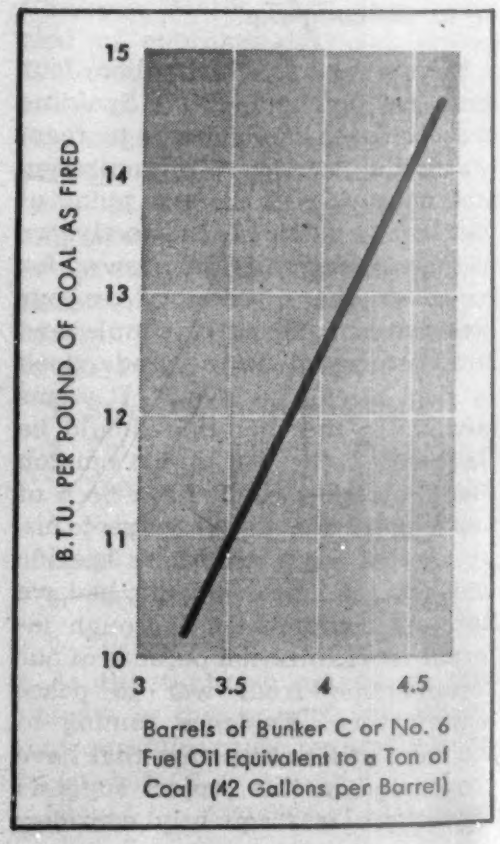
BURNED at the same boiler efficiency, Bunker C or No. 6 fuel oil costing 4 cents per gallon is equivalent to high-grade bituminous coal at $8 per ton; 5-cent oil is equal to $10 coal; and so on.

Thus, if your fuel market supplies oil at, say, 4½ cents and the best coal at $7, the oil equivalent is $9 and coal is 2/9 or 22 per cent cheaper than the oil.

This simple method of evaluation is based on 150,000 B.t.u. per gallon of oil *versus* coal of 14,000 B.t.u. per pound, in which case 4.45 barrels of oil equal a ton of coal. The heat value of Bunker C fuel varies only slightly on the gallon or barrel basis. Coal varies considerably, depending on its source. Thus 4.12 barrels of fuel oil equal one ton of 13,000-B.t.u. coal. Other equivalents are shown on the chart. This is sufficiently accurate for a preliminary comparison of coal-oil equivalents.

Other factors must of course be considered in each separate situation for a complete comparison. Labor costs, coal and ash handling, cleanliness, suitability and safety of boiler and furnace, reliability of supply, fuel storage facilities, etc., are some of these factors.

In localities where both fuels are available, the boiler plant should be designed to burn either fuel alternatively to insure continuity of operation and production, and to take full advantage of changing market conditions.



Better control of maintenance expense offers all industry a big opportunity to lower its product cost . . .

Maintenance savings can be had by predetermining maintenance requirements and efficiently planning their execution. Operating savings of all kinds will flow from decreased machine downtime . . .

Here is a five-step program to achieve these objectives:

1. DETERMINING THE MAINTENANCE WORK LOAD . . . . . page 88
2. SCHEDULING THE WORK LOAD . . . . . page 89
3. GETTING THE JOB COSTS . . . . . page 94
4. MEASURING THE ACHIEVEMENT . . . . . page 95
5. REPORTING TO MANAGEMENT . . . . . page 96

PICTORIAL SYNOPSIS OF THIS PROGRAM APPEARS ON PAGES 90, 91, 92, AND 93

HOW OFTEN have you considered your maintenance costs and wondered what you could do about reducing them? Did your consideration suggest as the only solution re-equipping your plant with new machinery you can't afford to buy in today's market? Or have you, like many others, shrugged your shoulders and counseled yourself that you always *have* to make repairs, so *how* can you control the expense? Or perhaps you have already established an elaborate accounting system of job orders, work orders, appropriation requests, and so on, only to find that, while you know what your maintenance costs are, 30 days after the job is complete, it's too late to do anything about them?

We'd like to present a means of control which has successfully controlled maintenance costs in other plants and, with modifications to suit your particular needs, can do as much for you. What is more important, however, is that all needed maintenance work will get done. Outside the removal of the demoralizing lack of appeal to workers in a plant that looks run down, the cost of keeping equipment in tiptop shape will usually be repaid many times through the elimina-

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tion of production downtime. Surprisingly enough, many otherwise well-run plants don't even know the amount of this downtime, let alone its cause. To cite one case, in a large midwestern plant it was recently discovered that one hour in eight for each direct worker was being lost through non-productivity. Furthermore, 42 per cent of this lost time was directly attributable to a lack of maintenance control procedures.

First Examine Organization

What are the prime requirements of a satisfactory maintenance control plan? Let's look at the organization that should administer the plan.

Maintenance as a function ordinarily should be responsible to the plant engineer. The plant engineer ought not be a part of the plant production organization. The reason is obvious; it's not a human trait to report one's own faults or failures to top management. Separation of production and maintenance-engineering forces will serve to keep management informed of such things as improper use of equipment (by production forces) or inadequate lubrication (by maintenance forces). A maintenance superintendent or foreman may or may not be needed under the engineer, depending on the plant's size.

Segregation of the maintenance working force into crafts depends, too, on the size of the plant, as well as union relationships. In any event the maintenance organization should include a good clerk for a control function we shall later describe. It should also include a staff of maintenance inspectors.

Having set up the basic organization, what are we going to do with it? To decide, let's agree on the normal work expectancies of a maintenance organization.

There are two types of maintenance work, corrective maintenance and preventive maintenance. Corrective maintenance is the repair of breakdowns or the work most people wait for and call the cost "maintenance." Preventive maintenance involves any repetitive function (inspection, adjustment, cleaning, lubrication, etc.) that can be controlled by schedule.

Of the two types, preventive maintenance is the more important. It substitutes the labor cost necessary to hunt up and correct *minor* troubles for the cost of waiting until they become *major* breakdowns and require expensive repair jobs. Sometimes a third work element, that of new construction work, becomes a responsibility of the maintenance force. In such cases more manpower might be needed, but the proposed features of control can be extended to include new work with similar effectiveness.

Now that the over-all task of a maintenance department has been defined, and the organization to handle it, we next analyze how best to accomplish the task. This analysis resolves itself to answering:

1. What, in detail, are the jobs required of the maintenance force?
2. How can these jobs be accomplished most efficiently?
3. How shall the labor-hours and material units expended by maintenance workers be gathered for later cost analysis?
4. How can a standard of performance be established against which the actual maintenance costs can be measured?
5. How can these facts be used to improve executive understanding and administration?

It is proposed to answer these five questions in the following five chapters, which describe how methods of control are applied.

1 • DETERMINING THE MAINTENANCE WORK LOAD

First attack on an unstable and heavy backlog of maintenance rush job is the institution of good preventive maintenance procedures

THE MOST OBVIOUS and usual determinant of what work is required of the maintenance force is the requests it receives, either written or oral, from the plant production supervisors. *But this is not the way it should be.* Instead, there should be a staff of inspectors who make regular cyclic inspections of all equipment in the plant. As a result of their findings the plant engineer is in the position of writing job orders to the maintenance crew to perform the required preventive maintenance work. Repair orders should be in the minority.

To achieve this status, however, the inspectors cannot be sent on haphazard trips around the plant. Schedules, in written form, are made available for each inspector. They show, among other things, (1) the equipment number and name of each item to be inspected, and (2) what is to be inspected on this equipment. Each schedule is summarized in accordance with its periodicity—i.e., all work to be done daily is on a daily schedule; all work to be done weekly is on a weekly schedule, and so on.

Preventive Inspection Form

An electrical-motor inspection form used in a small plant is shown at the beginning of the flow chart on page 90. Note that it provides space for the inspector to check off each item of equipment as the inspection is made, and also provides space for his signature when the schedule is completed. Thus the responsibility for proper functioning of equipment is placed directly on an inspector. Also observe that the form provides room for the inspector to note any repair work to be done.

The usual means of establishing a full complement of preventive maintenance schedules such as this is as follows:

1. Prepare a listing of all plant assets, preferably on cards, one for each item.
2. Establish a numbering system that will identify each piece of equipment.
3. Determine the type of maintenance inspection each piece of equipment requires.
4. Sort the equipment cards prepared in step 1 into the segregation groups determined in step 3.
5. Decide the frequency with which each item shall receive the inspection required.
6. Prepare inspection schedules for each department by type of inspection for each day of the week, to balance the work load, and to provide the adequate inspection previously determined upon.

This was the method used to prepare the aforementioned electrical-motor inspection schedule.

2 • SCHEDULING THE WORK LOAD

Paperwork is needed to originate job orders, authorize the work, estimate costs, and schedule work in the order of its importance

HAVING DETERMINED the nature of the maintenance work load, whether originating through preventive inspections or through notification by your production forces, there must be a medium of translating the requirements into action. Verbal instructions are not sufficient. A written job order factually stating the job requirements should be prepared for each and every request for maintenance. This may seem to be establishing a lot of paperwork. Maybe it is, but here's what it will accomplish:

1. By writing each request on a formal job order the plant engineer can know the total work requirement ahead for his maintenance crew. Do you know this now? Do you know whether your crew is overmanned or undermanned, based on the actual work ahead? If you are the average plant, you don't.

2. Having the written orders in front of him, the plant engineer can schedule the work in accordance with its urgency, and fully utilize his workers' time. Further, he can ascertain at once whether those "special" maintenance men assigned to Joe Doaks's department for the past three years on a permanent basis, are necessary. If there's enough work to keep them busy, that's great. Leave them there. We'll warrant, however, that an analysis of actual maintenance needs will be an awful surprise. In one very large processing plant it was found that 12 machinists were "permanently assigned" to one of the production departments because of the "urgent need" for maintenance work to be done "right now." After establishing preventive maintenance inspections and insisting on a written job order for each request for maintenance work, the "permanent crew" was reduced from 12 to 2 men.

Job Order Form

The form that the job order takes is relatively immaterial so long as the basic requirements are fulfilled. They are (a) a simple numbering system whereby each maintenance worker can charge his time to a definite job order (as will be explained later); (b) space for the equipment number, name, and location in the plant or the unit to be serviced; (c) sufficient space to write a detailed description of the job to be performed; and (d) space for signatures of the person requesting the work, the person approving the work, and the worker responsible for completing the work.

The number of copies of the job order to be prepared also will vary in each plant. The typical job order form illustrated in the flow chart was prepared in three copies; the original (white) copy was for the worker in charge of the job, the buff (duplicate) copy was retained by the maintenance superintendent, while the triplicate (manila card) copy was used by the maintenance control clerk as a costing copy. In another plant a fourth copy also was prepared for the maintenance storeroom as a part of a material costing procedure.

The job order system itself is easy to install. Each request for corrective maintenance must come to the maintenance control clerk located in the maintenance supervisor's office. He prepares a maintenance job order as shown in the flow chart on page 91, and secures proper approval.

Repair jobs or alterations involving a total cost over a certain limit, usually fixed somewhere between $100 and $500, should be formally estimated by a responsible engineer, and should require approval on a higher managerial plane than the maintenance supervisor. Reasons for this are obvious; detailed planning on scope, method, types of material and equipment, and perhaps planning on departmental shutdown, all should enter into the decision. Further, too much emphasis cannot be placed on the provision of working drawings (prints, sketches, etc.) where possible. The time and expense necessary, for example, properly to lay out a large piping job in advance will be repaid many times over by the labor saving as against having workers "cut and fit" each section of pipe as the job progresses.

Space does not permit going into all the necessary details surrounding a procedure for handling formally estimated jobs. They are many, and they vary with each plant. It suffices to say that *some* estimating procedure should be developed; further, this article is intended to deal with the normal, routine work where, without sufficient control, a large percentage of cost is apt to be buried in a general maintenance account.

Scheduling the Work

When the established routine for preparation and approval of the maintenance job order has been completed by the control clerk, he gives the first two copies of the job order to the maintenance supervisor and retains the third copy in his own file as a costing medium. The maintenance supervisor roughly estimates within broad limits the number of man-hours the job will take and lists the material requirements on his copy of the order. After he is sure the materials to do the job are on hand, he decides when the job can be done.

Some sort of job priority must be established. Normally, the following will suffice:

1. Repairs that are occasioned by breakdowns.
2. Repairs that are the results of inspections.
3. Repairs that, if not made, will be hazardous to workers' safety.
4. Repairs that, if not made, will result in loss of product or breakage of machinery.
5. Routine plant requests.
6. Alterations or capitalized jobs.

The maintenance supervisor then files his duplicate copy of the order in a day-to-day file under the date on which he expects the work to be completed. This would ordinarily be within the ensuing three days. The worker's original copy of the

Text continues on page 94. On the four pages immediately following is shown a pictorial synopsis of the application of the principles and methods of control discussed in this article

HOW A REPAIR JOB IS CONTROLLED AND ITS COST ACCUMULATED

1 Maintenance inspector finds these necessary repairs during regular cyclic inspection (on April 14)

He turns in report to maintenance supervisor, who requests control clerk to prepare maintenance job order for him. Supervisor then estimates cost and plans work

ELECTRICAL INSPECTION SCHEDULE—MOTORS

DEPARTMENT *FINISHING #3* CYCLE *WEDNESDAY ONLY*

DESCRIPTION	MOTOR NUMBER AND NAME								
Check all items shown. List and describe in detail any repair work on bottom or reverse side of this sheet NOTE: Notify production workers before shutting off motors to make tests #1, 3, 5, and 6 below, where necessary	Finishing Department Elevator Motor 288	Laminator Starch Return Pump Motor 294	Laminator Asphalt Return Pump Motor 297	Laminator Mixer Tank Pump Motor 300	Laminator Mixer Tank Agitator Motor 302	Laminator Reeves Drive Motor 292	Tank Car Asphalt Pump Motor 320		
1. Check Bearings (earphones)	✓	✓	✓	✓	✓	✓	X		
2. Check Brushes	✓	✓	✓	✓	✓	✓	✓		
3. Check Mountings – vibration	✓	✓	✓	✓	✓	✓	✓		
4. Check Clearance – feeler gage	✓	✓	✓	✓	✓	✓	✓		
5. Check for Overload (amm.)	✓	✓	✓	✓	✓	✓	✓		
6. Check for Overheating	✓	✓	✓	✓	✓	✓	X		

MOTOR NO.	REMARKS
320	MOTOR OVERHEATED. HOT TO TOUCH. BEARINGS
	APPEAR TO BE GONE.

INSPECTED BY *J Brown* DATE *4/14* JOB ORDER NO. *3-3*

2a Original job order — placed by supervisor on schedule board under worker's name (with notation to be done on April 16)

2b Duplicate job order — maintained by supervisor in day-to-day file (under April 16) after he marks labor-and-material estimate in space shown

2c Triplicate job order (heavy card stock, obverse side shown) — filed in cost file under order number by maintenance control clerk

MAINTENANCE JOB ORDER

Date of Order	Equipment No. and Location	Order No.
4/15/48	320-FINISH DEPT. #3	3-428

Charge Account No.	Equipment Available
672	TODAY AFTER 1 P.M.

DESCRIPTION OF WORK TO BE DONE:
(List major material requirements)

Pull motor shaft - check bearings. If necessary bring to shop for new bearings and substitute Motor #488 now in store room

Notify store room at once if new bearings to be ordered

ASSIGNED TO:

START JOB:

COST SUMMARY — MAJOR JOBS			
	Actual	Estimate	Variance
LABOR	35.00	4.50	30.50
MATERIAL	9.75	7.00	2.75
TOTAL	44.75	11.50	33.25

Ordered By	J. Brown	Date 4/14
Approved By	ABC.	Date 4/15
Completed By	GGR	Date 4/16

3 While working on job, craftsman charges time to job order (No. 3-428) on whatever type of job time ticket is in use. At completion of job, original copy of job order is initialed by worker and returned to control clerk, and filed until discarded.

4 Labor costs (from job time tickets) and material costs (from invoices) are posted by control clerk to obverse side of cost copy. Return of worker's "completed" copy is signal to clerk to close job and remove cost copy from open job cost file. Labor and material costs are totaled thereon to get job cost.

ASSIGNED TO: G. G. Rogers

START JOB: 4/16

COST SUMMARY — MAJOR JOBS			
	Actual	Estimate	Variance
LABOR		4.50	
MATERIAL		7.00	
TOTAL		11.50	

Ordered By	J Brown	Date 4/14
Approved By	ABC.	Date 4/15
Completed By	GGR	Date 4/16

LABOR COST CHARGE ACCOUNT 672

DATE	MAN-HOURS	COST
4/16/48	17.5	$ 35.00

MATERIAL COST CHARGE ACCOUNT 672

DATE	DESCRIPTION	QUANTITY	COST	INITIALS OF USER
4/16	SHAFT BEARING	1 SET	9.75	GGR.
	PACKING (OIL)	—		GGR.

5 Job cost is posted to an equipment record (not shown on this flow chart). Cost copy is then routed to supervisor for (1) closing his file and deactivating his duplicate copy, and (2) comparison and investigation of actual cost against his estimate. Cost copy is returned to clerk and permanently filed under job-order number.

CONTINUED ON NEXT PAGE

5 CONTINUED
Before clerk files completed jobs, he posts labor cost totals to work sheet for accumulating weekly maintenance labor costs

WEEKLY JOB LISTING

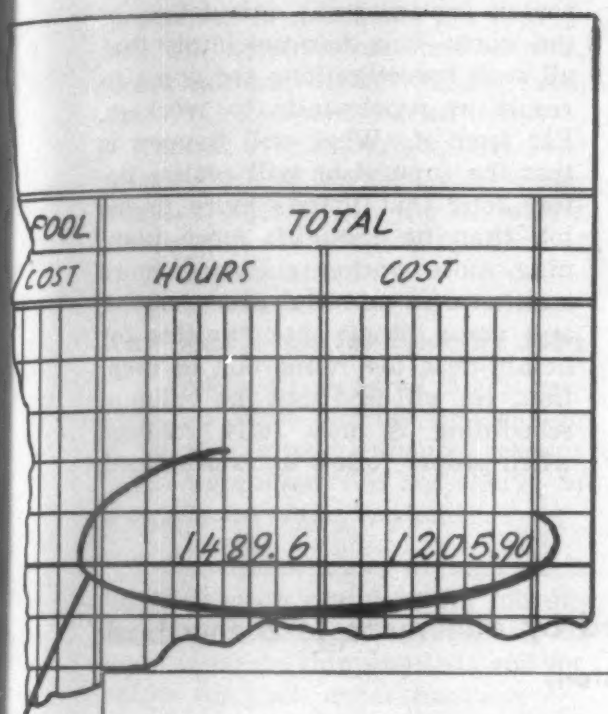
Week Ending April 17, 1948

	MACHINISTS		ELECTRICIANS		CARPE
	HOURS	COST	HOURS	COST	HOURS
REPAIRS TO OPER. DEPTS.					
3-428			17.5	35.00	
ETC.			—	—	
				—	
TOTAL			48.0	87.63	
REPAIRS TO OVERHEAD DEPTS.					
TOTAL					
PREVENTIVE MAINTENANCE INSPECTIONS					
TOTAL					

6 At close of each week, after open job orders have been totaled and posted to work sheet for labor-hours and cost, the weekly job listing is analyzed and made the basis for entries of "actual" costs on the weekly management report

7 "Standard" man-hours and labor costs are computed from established ratios applied to current week's production (or to kilowatt-hours consumed, or other proved measuring device) and are posted weekly to the management report. Weekly and cumulative variances are then calculated

8 Management can quickly tell from these variances which craft is out of line (from upper section) and what the various types of maintenance work are costing (from lower section)



WEEKLY MAINTENANCE LABOR SUMMARY

For Week Ending April 17, 1948 Cumulative Since Week Ending

	MAN-HOURS				LABOR COST (Dollars)			
	Standard	Actual	Variance	Cum. Variance	Standard	Actual	Variance	Cum. Variance
Machinists								
Electricians		4.80				87.63		
Carpenters								
Welders								
Labor Pool								
TOTAL								

ANALYSIS OF CRAFT HOURS AND COST

Routine — under $100								
Repairs to Operating Departments		1489.6				$ 1205.90		
Repairs to Overhead Departments								
Preventive Inspections and Lubrication								
TOTAL ROUTINE WORK								
Alterations and other — over $100								
Capitalized jobs								
Supervision and clerical								
TOTAL								

order is then clipped to a schedule board located centrally within the department, where it is readily visible and available to workers. The schedule board is simple to make, and usually takes one of two forms. In a small plant there will be a separate clip for each worker. These clips are secured to a large plywood board, and have one worker's name over each clip. In larger plants where each craft has a lead man or crew chief the clip is usually set up by craft, and all work for a craft is set up under one clip. This type of scheduling by craft necessitates a separate copy of each job order for each craft involved in the job.

All necessary steps have now been taken to schedule all types of maintenance work for the best performance, and to provide a smooth and orderly flow of job orders. The status of any order can be determined quickly, and responsibility for the quality of work, and when it should be done, has been fixed. It's now up to the skilled craftsman to contribute his talents toward efficient completion of the job.

When the maintenance job has been completed, the worker in charge signs and returns the original job order to the maintenance office. The maintenance control clerk so notes his own cost copy of the order and files the worker's copy for a temporary period up to about 3 months. This provides a record of the job completion, signed by the worker, in the event that the repair job is not satisfactory.

How the control clerk develops the cost copy will be described in the next chapter. The finished cost copy of the order is turned over to the maintenance supervisor. He matches this copy with his own copy, compares his estimated cost with the actual cost, and notes any variances that warrant investigation. More on this important phase of cost control also will follow. The cost copy is then returned to the maintenance control clerk, and the maintenance supervisor's copy is either retained or destroyed. Every job follows this simple order routine from its birth to its grave.

Sometimes unforeseen delays occur in the life of a job order. In order that these delays are not hidden, and thereby overlooked with costly consequences, the maintenance supervisor should periodically scan his day-to-day file to see which orders, if any, are still outstanding that should have been completed. After noting such delays, the supervisor takes a trip around the plant to find out the reason for irregular completion of the work. This does not imply that all such investigations are going to result in reprimands to workers. Far from it. What will happen is that the supervisor will realize before long that there's more to his job than he thought; more planning, more worker guidance, more assistance in material procurement, and many other opportunities for helpfulness too numerous to mention. He will find that the value of scheduling is only fully realized when proper follow-up is practiced.

3 • GETTING THE JOB COSTS

Accurate maintenance costs can be accumulated by adherence to a few basic rules that don't require a complex accounting system

MAINTENANCE COSTS are of no value unless they are reliable. This is the foundation stone of every cost system. Are you sure you are paying for plant maintenance only and exactly what is reported to you? It might be less, but usually is more. Is everything being charged to maintenance that should be charged? And is it being charged to the right job? An accurate breakdown of maintenance costs is only second in importance to reliability of figures. Without it, sound interpretation of cost figures is impossible.

The formula, then, for knowing what your maintenance costs are, is to get accurate costs of *every* job. No job is done without recording time and material expenditures—no expenditures are applied to maintenance jobs without proper authorization. Such authorization is given by the numbered job orders, or by standing work orders of very limited application. Let there be a warning inserted here against the wide adoption of standing orders to simplify the paperwork requirements. Such procedure is sound only when used for repetitive operations such as lubrication, sanitation, etc., where there is no question of its application. The danger lies in the use of a standing order as a general sump for "foreign" expenses, when it soon assumes the status of a miscellaneous expense account. The rule is, the fewer such accounts, the better the control.

As already shown, while each repair job is being performed the worker's copy of the job order is in the hands of the worker in charge of the job. He, and the men assisting him, will charge their time on a job time card to the job number appearing on the job order. Here again, there are many types and designs of job time cards. Regardless of the type used, provision must be made for the timekeeper, or payroll clerk, to reconcile the total hours charged to jobs with the total hours to be paid each worker each day. Also, space is needed on the job time card to convert the total hours worked by each worker into labor cost. Each day these reconciled job time cards are sent to the maintenance control clerk for posting of labor-hours and labor cost to the reverse side of his cost copy of each

This article does not offer a stock-in-trade system that can be taken off the shelf and applied to any plant without refinements or alterations. It is intended to make you think of the cloth of basic principles that can be tailored to meet the contours of any individual plant operation. Application of these principles should result in a better looking plant, a more efficient maintenance staff, and improved operating economies

job order, as shown on the flow sheet on page 91.

Materials Control Procedures

So much for gathering labor costs, but what about materials used? Material costing procedures are as varied as any other phase of material control. Here again the degree of control must suit the individual plant requirements. However maintenance material can usually be segregated into two distinct categories: (a) Material especially purchased for a specific job or project; (b) stock items such as nuts, bolts, screws, nails, welding rod, and other commonly used items.

Control over materials, both costwise as well as physical, can be reasonably assured if the following procedures are adopted for each of these classifications:

(a) Materials for Specific Jobs

1. Order all material for a specific job order number and charge it to the proper expense account when purchased (do not charge to a supply inventory account).

2. Instruct vendors to mark each box or carton plainly with job order number when shipping, and to issue separate shipping lists and invoices for each order number.

3. Lock the maintenance stockroom and set aside an area therein for the segregation of all the items to be purchased on a specific job order.

4. When the storekeeper has received all of the specific purchases for a given job (as shown on his material listing on the job order) he should then notify the maintenance foreman so that the project may be started.

5. As the invoices are received in the purchasing department, arrange for clearance of all invoices or copies through the maintenance control clerk for posting to the material section of his cost copies of job orders.

(b) Stock Items

1. Order all material for stock in accordance with the maximum-minimum plan for replenishment as determined by each company's own needs.

2. Record the physical quantities on some form of stock inventory record with the usual "Receipts," "Issues," and "Balance" columns.

3. It is not necessary to carry dollars and cents costs on these records. Neither is any extensive requisitioning system necessary. If the time will be taken to analyze the ratio of dollar cost of major material items (charged directly to jobs) to these small stock items over a period of a year or so, a satisfactory percentage can be determined by which each job order can be "loaded." To use a hypothetical example, let us suppose that the percentage determined as above is 3.000 per cent and that we are "costing out" a closed job order. We multiply the total *A* (specific) material cost for each work order by 3.000 per cent to determine the amount by which we will load the work order to cover the *B* (stock) material.

4. At the close of the month total all job orders for the *B* material thus calculated and use the resultant cost as the basis for a charge to expense and a credit to the maintenance inventory.

5. Physical inventories of this *B* material, when costed and reconciled to the book inventory, will determine whether or not the percentage to be used in the next period should be increased or decreased.

The chief reason for instituting control on *B* material is for cost purposes. The danger of pilferage is best overcome by locking up all the material. If workers earnestly desire to pilfer material they can always find the means to do so. As one plant manager stated recently, "They will still get their plumbing out of our stockroom, but with a control it takes 3 years instead of 30 days."

4 • MEASURING THE ACHIEVEMENT

Proper evaluation of the cost data requires establishment of standards against which actual performance can be compared

NOW THAT THE MEANS have been provided to accumulate all the labor and material expenditures for arriving at the total cost of each job order, the questions logically arise —"Is it good or bad?" and, "What can be used as a yardstick to tell?"

To answer, a "standard" is needed to determine how much the job should have cost, as compared with what it did cost. Such comparisons are usually more concerned with labor cost as the variable factor that needs control. Material costs are so well documented that variations are not difficult to explain.

Standards on large, formally estimated jobs are simple to determine at any point of progress or completion. The original estimate itself is the final goal. To check intermediate progress, it is only necessary for the plant engineer, maintenance supervisor, or other qualified person to inspect the job and estimate the percentage of physical completion. This percentage, applied to the original estimate, will provide the estimated man-hours utilized to date.

The cost of making preventive maintenance inspections is also readily obtainable. After repetitive schedules have been established and sufficiently tested to establish their accuracy, the time necessary to make each inspection can be obtained either by stopwatch or by averaging the time in which the job was performed over a representative period.

The standard for ordinary repair jobs is obtained in quite another way. It is neither possible nor warranted to make accurate, detailed estimates on these innumerable jobs. However, if it is conceded that over a cyclic period maintenance costs in a given department have some relationship to the productivity of that department, then standards can be established on a budget principle. This method is beyond the stage of theory and known to be in successful practice. In its application some measurement of productivity is selected in each productive department and used as a base against which the actual maintenance costs can be compared. Whether the base will be "man-hours of direct labor," "units of product produced," "kilowatt-hours consumed," etc., will vary with the plant.

Whatever base is found best

should be compared with the maintenance labor-hours (or total cost) for a sufficient period to test its validity and thereby establish a fair base percentage for computation of current standards. In plants having separate maintenance crafts this comparison should be extended on a craft basis. This is for a very definite reason. Unless the performance can be measured by each craft in each department for which work is performed, then much of the purpose of control is lost. It is of little use to know that costs are "too high" in a given department unless we know which craft is causing the high cost. Moreover, if the plant wishes at some future date (after the control procedure *has* controlled maintenance) to use the standards as a basis for maintenance labor budgets, the tools of control by craft grouping are available, already tested and proved.

When the base percentages are finally established they are applied to the weekly measuring media currently to obtain the standard hours (or total cost) which should have been expended by each craft during that period.

It is not to be expected that a comparison of actual performance *versus* standard figures in any specific week will result in no variance. Over a 4-week period, however, the cumulative variance should be at, or near, zero. Two things will affect any single week's comparison. First, there will always be instances when a large nonrepetitive job will be performed which will destroy the normal relationship. Second, and of more importance, is the fact that as closer control is gradually attained over maintenance expenditures the ratio between maintenance costs and the unit of measurement used as a measuring stick will decrease.

We have never established a control procedure where we didn't find at the start that a huge backlog of undone maintenance work existed. (This backlog, incidentally, is another very good reason for control.) Under the control procedure it gradually gets cleaned up, and the maintenance cost must inevitably decrease. For this reason it is advisable to review and revise the standards periodically; three times per year for the first year, and twice per year thereafter, is a general suggestion.

5 • REPORTING TO MANAGEMENT

Three report forms provide executive management a continuing panorama of plant maintenance, and tell where to apply the brakes or the whip

THE COST FIGURES derived in the routines of the preceding chapters are only dynamic when they are applied and interpreted. What is done with this information can change a bare statistical knowledge of the facts into a working force for better maintenance control and administration.

Three applications of these cost data, involving an equipment record and two reports to management (one weekly and one monthly), will illustrate the potency of these statements.

Equipment Record

It is recommended to enter the actual cost and type of each repair on an equipment record. This is an extremely important step, yet many plants ignore it. There is no better way of determining the value of a piece of equipment than by reviewing a historical record of its upkeep cost. We recall vividly the reaction of unbelief of one executive when shown that a certain piece of equipment in which he took great pride cost him twice its original value the first three years of its use. Equipment records, of course, have many other allied uses. Public utilities have used this medium for years as a means of individually depreciating book cost. Further, if properly designed, the record serves as a plant location register. How much equipment is buried in your own plant "in salvage" or in a dead-storage warehouse, which could be put to good use if its existence were known? By all means, however, record the cost of each maintenance job on an individual equipment record.

Weekly Labor Summary

The next step is to present these figure-facts to executive management in the form of a weekly report. And here may we emphasize that this report should be prepared and be on management's desk not later than Tuesday of the week following that in which the costs were attained. There is nothing more useless than a report presented long after the facts have become ancient history, if that report is intended for procuring remedial action.

The report form suggested is simple. It is called the "Weekly Maintenance Labor Summary." As shown in the flow chart on page 93, it provides a breakdown of craft-hours and costs in the upper portion of the form. In the lower section is a breakdown of the type of maintenance for which the costs were incurred. Thus, an over-all analysis of the report will reveal not only which craft is out of line, but in which category of work the cost is being expended.

It will be noted that a "cumulative variance" column has been provided. This is for a reason previously stated—namely, that the cumulative variance should approach zero. Any continuing variance whereby the "actual" is consistently below the "standard" indicates that maintenance work is being slighted. It means somebody is skipping something somewhere, or else the standard is incorrect. Conversely, any consistent increase in "actual" over "standard" is indicative that the maintenance force is overmanned.

Monthly Job Progress Report

One other report is required, preferably monthly, and that is a report of backlog work. This report consists merely of a listing of the job orders yet uncompleted by number and brief description. Its prime requirements are to show the dates of the job orders, listing them in chronological order, and to provide a space for pertinent "comments" stating why certain jobs are still incomplete. Sometimes the inclusion of two extra columns to show estimated cost and cost-to-date are helpful to executive action.

There is every confidence that this report and the previous one, *intelligently acted upon*, will result in lower plant maintenance costs. What is more important, however, is that your maintenance work will get done and your productive time in plant operating departments will increase.

GOOD FACILITIES MAKE TRAINING EASY

PROPER facilities for carrying on training are considered essential by the Stoody Company, Whittier, Calif. Trainees are of two principal kinds: (1) People learning to use Stoody products; (2) people learning to sell those products. The facilities provided are equally applicable for use in plant worker training. The room illustrated was specially designed for carrying on the training operation.

AT THE FRONT of the room are two welding booths equipped with protective glass so that observers can watch welding procedures without the necessity for using goggles or helmets. One of the booths is used for arc welding; the other one is devoted to acetylene welding.

AT THE REAR of the room is a projection booth containing sound and silent 16-mm. projector and slide projector. When pictures are to be shown, the sidewalls of the room are raised to shut out light. Motor operated, the movement is controlled from the projection booth. The wall at left is shown partially raised. In the room are displays of the company's products, grinding machines and hard-facing rods.

CONVEYORS have become principal means of transportation at Emerson. Location of inspection stations at conveyor transfer points has eliminated a major source of double handling. Quality control charts (arrow) are prominently placed where they serve as constant reminders to employees and inspectors alike

BETTER HANDLING—DOUBLE OUTPUT, HALF THE FLOOR SPACE

Layout and integrated mechanical handling have improved quality control and made incentives possible

HENRY C. MILLER • WORKS MANAGER, EMERSON ELECTRIC MANUFACTURING COMPANY, ST. LOUIS

A HANDLING system, which has been tried and proved, has doubled output at Emerson Electric. By integrating overhead rail, powered belt, and gravity roller conveyors with steel slides and chutes, handling has been minimized, floor area cut in half, and unit cost substantially reduced.

Previously, the various parts of the motor were built in separate departments. The finished stock was then delivered by trailer truck to its point of assembly. Wide aisleways were required for movement of materials. Production was inefficient and awkward with this type of layout. It was frequently impossible to balance the production of the various lines, and sometimes material would pile up at one or more points. Or else there would be shortages. Either way, inefficiencies resulted, and materials handling was excessive.

With the new layout and the conveyor system, most of the inefficiencies have been eliminated. All of the various production lines are interrelated, and materials feed progressively into a single mass production assembly system.

To say that all handling has been eliminated, except at conveyor transfer points, is nothing unusual. Any well-planned conveyor installation can be expected to accomplish that much.

Double Handling Saved

But at Emerson all inspection stations have been located at these transfer points. In other words, if it is necessary to inspect the parts at all, it is done at conveyor transfer points, thus eliminating double handling. Inspectors remove parts from one conveyor feeding in, make their inspection, and then place the parts on the conveyor feeding out. The result is max-

imum production efficiency, and a marked reduction in handling cost, as well.

One overhead power rail conveyor line in the system is used also as a traveling stockroom. The result is that the only handling in the entire production set-up is at the inspection points and in the delivery of materials to the beginning of the assembly line.

The arrangement of conveyors and skids in the packing room area makes it possible for the completed motors practically to stack themselves on the outgoing pallets. By thus eliminating all in-process handling, interdepartment aisleways have been reduced to a minimum; this accomplishment alone resulted in a large saving of floor space.

Quality Control Charts

Percentage quality control charts are located at each station for each major part. The charts are posted daily and are visible from a considerable distance.

Furthermore, each inspector is responsible for the quality of all production preceding his point in the line to the next inspection station. Corollary to this, he has the right to stop all operations immediately if defective work is found.

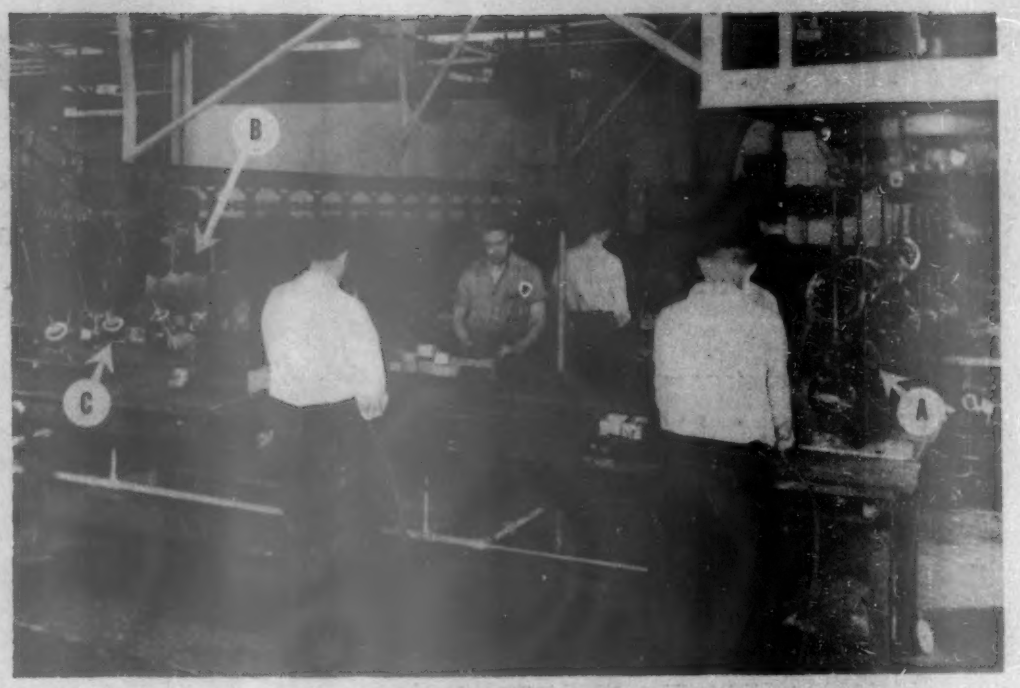
This authority which is vested in the inspector, in combination with the constant reminder provided by the charts, serves to keep both workers and production supervisors on their toes. The result has been an appreciable reduction in the necessity for reworking on parts.

Other advantages have accrued as a result of this new installation. They include:

1. Operations have been processed to a degree of simplicity so each operator performs only a relatively minor function of fabrication or assembly, thereby materially simplifying the training of new workers.

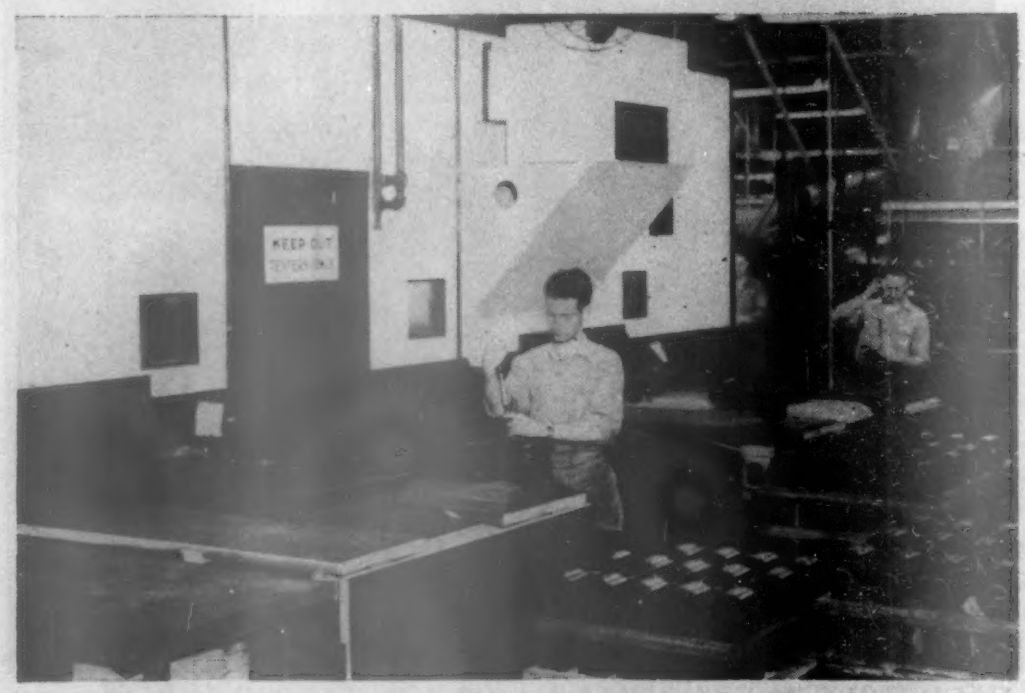
2. An improved wage incentive plan was made possible. Many of the operations, such progressive machining and assembly lines, are now paid on a group incentive basis, simplifying paperwork and accounting for work done by the various individuals.

3. Reduction of inventory in process has been accomplished. The streamlined mechanical movement of parts precludes choke points and pile-up of work in process.



START of final assembly line brings together stators (A), end shields (B) and rotors (C) from overhead conveyors for ride down "last mile"

MIDDLE section of main line has parallel or two-sided assembly set-up. Belt conveyor carries finished motors to test room at left rear

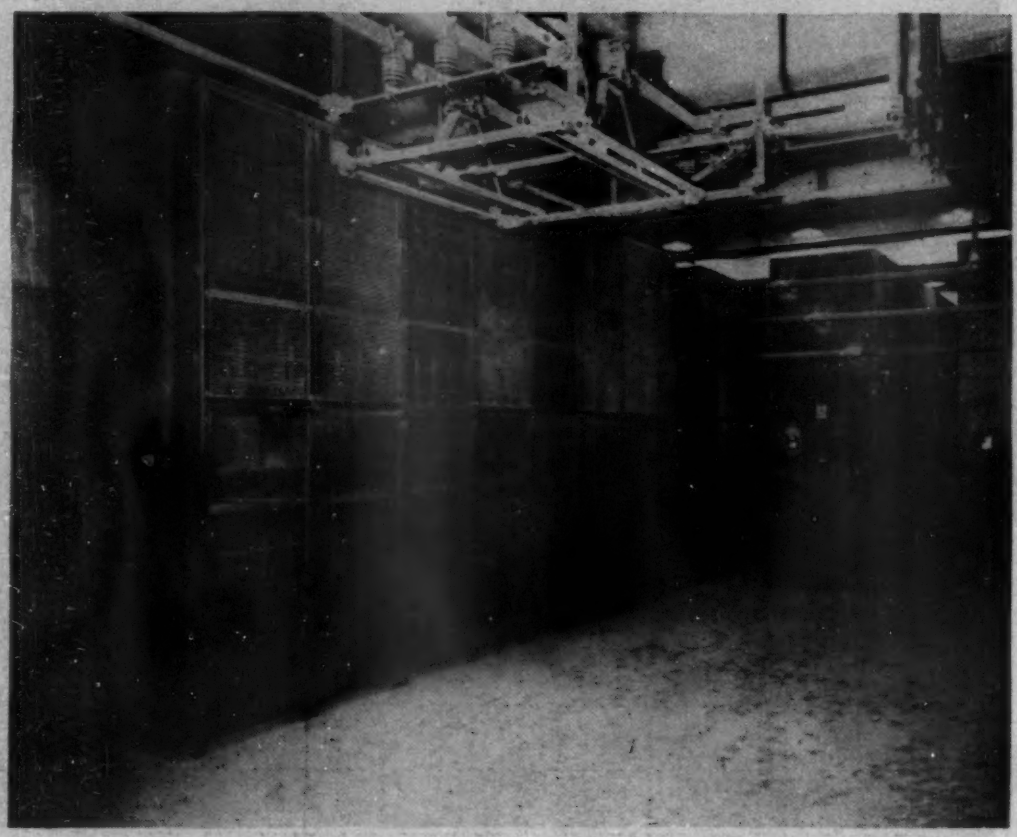


END of the line is far side of test room. Motors practically "pack themselves" on skidded pallets, which are moved by truck to shipping dock

CAPACITORS—WHY AND WHERE TO USE

PART I. What these specialists can do for ailing electrical systems, and how they do it, with some examples which show the advantages that have followed their application

HAMILTON BROOKS • SWITCHGEAR AND CONTROL DIVISION
WESTINGHOUSE ELECTRIC CORP., EAST PITTSBURGH



CAPACITORS (top) rated 9450 kva. saved their cost in two years, while the 660-volt capacitors (bottom) took only nine months to pay out

CAPACITORS can accomplish one or all of the following corrective functions: (1) Raise the plant power factor above the penalty clause base of the power rate; (2) relieve overloaded feeders and distribution circuits; (3) reduce heating losses in feeders and distribution circuits.

They perform these functions by furnishing the capacitive kilovolt-amperes, usually abbreviated kilovars or kvars., necessary to counteract the inductive kilovolt-amperes put into the system by motors and transformers.

Motors, transformers, welders, even the power conductors, use kilovars, incidental to their delivery of real power. The problem of applying capacitors is simply that of determining the advantages of supplying the necessary kvars. with capacitors, as compared to drawing them from the power source.

Obviously, the predominating reason for putting in capacitors is that their over-all cost is less than the cost of purchasing kvars. from the utility company. Case histories of capacitor installations in general substantiate this conclusion. As an example:

An eastern machine company installed 600 kvars. of capacitors to raise the plant power factor from 65 to 97 per cent. An 8 per cent reduction in power billing resulted. This was enough to pay for the capacitor installation in 16 months.

A small manufacturer in the Midwest installed a capacitor for $1875 and saved $1300 per year in the power bill.

A Power Factor Clause

The fact that capacitors can reduce power billing charges is of importance to industrial customers that have a power factor clause in their contracts.

The use of capacitors to permit plant expansion is hardly of less importance than monetary savings in power. It is common for an industrial plant to have to increase production quickly. If production equipment is available, all plans may be upset by the inability of

HERE 30-KVA. SHUNT CAPACITORS IN A LARGE STEEL MILL REDUCED PRIMARY LINE CURRENT TO AN INDUCTION FURNACE BY 64 PER CENT

the existing electrical facilities to carry the additional load. When it is found, as frequently happens, that improved power factor will permit connecting the new load to the present electrical system the matter may be decided by the length of time required to get and install larger transformers, more cable circuits, or perhaps new switchgear, as against the delivery and installation of capacitors.

Long-Standing Need

Need for capacitors also often arises from the urgent necessity for correcting a situation that has developed over a period of time. The plant load may have been increased beyond the capacity of the wiring system by the addition of a small machine here and there and by the

FOUR 15-KVA. CAPACITORS made a new transformer unnecessary

continuous use of a piece of equipment that was originally installed for part-time use only.

Saved Rewiring Job

For example, the heavy production schedules of one concern were found to have overloaded the electrical distribution system to such an extent that rewiring seemed the only solution. However, the connection of 420 kvars. of capacitors at properly selected points on the system raised the power factor from 55 to 85 per cent and thereby removed all need for increased feeder capacity.

In another instance, the pole-mounted transformer bank serving a small fabricator of welded structures was overheating. A 60-kvar. capacitor placed in an unused space

in the shop eliminated the need for an expensive new transformer installation. In addition, it paid for itself through a reduction in power billings.

For Poor Performance

In many cases poor machine performance dictates a capacitor installation. Efficiency, power factor, starting torque, and other characteristics of induction motors suffer from poor voltage regulation. In extreme cases of low voltage, motors have required a boost by hand in order to start them. Thus, overloaded feeders and transformers may adversely affect plant performance even though they do not heat up seriously enough to require replacement.

Improved performance through the use of capacitors to correct such situations is difficult to evaluate in dollars and cents, but it may frequently be the deciding factor when coupled with one or another of the more tangible results.

Another gain that often is overlooked is the reduction in electrical system losses when power factor is improved. The heat liberated in cables and transformers must be bought and paid for just the same as the energy used to produce useful heat, work, and light. The reduction in losses by power factor improvement and the reduced system current more than offset the insignificant loss in the capacitor itself. The result is a saving that usually is not foreseen.

Capacitor requirements are not difficult to calculate. A power factor improvement problem is simply a matter of applying kvar. generators. A motor for example requires a certain amount of kvars. to magnetize its windings. The amount depends on the size and speed of the motor, and a typical set of values is given in Table I.

Transformers likewise require kvars. for magnetization, and their needs are determined primarily by size. A good estimating figure to use is 3 per cent of the transformer kva. rating. The reactive kva. of the transformer is often overlooked because it appears of small consequence. It is in the circuit for many hours every month, however, if not continuously, and thus its consumption in terms of kilovar-hours builds up to a respectable sum.

TABLE I • THE KVAR. REQUIREMENTS OF TYPICAL 60-CYCLE INDUCTION MOTOR LOADS

MOTOR RATING HP	AVERAGE KILOVARS USED BY MOTOR				
	4 POLES	6 POLES	8 POLES	10 POLES	12 POLES
3	0.9	1.2	1.3		
5	1.6	1.8	2.4		
7.5	2.3	2.6	3.5		
10	3.0	3.5	4.5	5.0	7.0
15	3.0	4.5	6.5	7.5	9.0
20	4.0	6.0	7.5	8.5	11.5
25	5.0	6.5	8.5	10.0	14.0
30	7.0	8.5	10.0	12.5	15.5
40	8.5	10.0	12.5	15.0	18.5
50	11.0	12.5	15.0	18.0	23.0
60	13.0	15.0	18.0	22.0	26.0
75	17.0	18.0	22.0	27.5	33.0
100	22.0	25.0	29.0	33.0	38.0
125	26.0	29.0	33.0	40.0	45.0
150	32.5	33.0	36.0	45.0	52.5
200	40.0	42.5	45.0	55.0	65.0

Simple to Figure Needs

An example will illustrate the simplicity of determining capacitor requirements: Assume a connected load of a 3-hp. and a 5-hp. four-pole motor, and a 7½-hp. six-pole motor. Otherwise, power is used for little else than lighting. Reference to Table I gives kvars. for the motors of 0.9, 1.6, and 2.6 respectively, or a total of 5.1 kvars. The nearest standard capacitor rating is 5 kvar., which will bring the power factor so near to 100 per cent that any billing charge because of power factor penalty will be eliminated.

Note that the capacitor is applied on the basis of the kvars. required by the motors only. Power factor is considered only when necessary to calculate the effect on the power billing.

A larger plant is not much different from a group of smaller plants, all under one roof. In fact a large plant frequently is divided into a number of sections that correspond closely to smaller plants as regards power use and capacitor applications. There is one important difference, however, that leads to more economical capacitor use. With a large number of independent power-consuming operations, only a small percentage of the total will be in use simultaneously, or will be drawing their full load at the same time. In fact the demand factor, or ratio of connected load to actual load, is often only 25 or 30 per cent.

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The second part of this article will appear in an early issue. It will point out the factors that must be considered in applying shunt capacitors for power factor correction, with some tips on the use of series capacitors

NON-NEGOTIABLE

THE BARDES FORGE AND FOUNDRY CO.
Cincinnati 14, Ohio

13-24
420
25239

By being absent two days
William F. Smith lost pay amounting to
Bardes $16 AND 00 CTS

AMOUNT
16.00

YOU COULD HAVE EARNED THIS MONEY—
BEING ABSENT COSTS YOU MONEY

To Osborne State National Bank
Cincinnati, Ohio

Bardes Forge and Foundry
Payroll Account
Geo. E. Bruscher
NON-NEGOTIABLE

NON-NEGOTIABLE

"CHECKS" SIMILAR TO THE ONE ABOVE, SENT TO EMPLOYEE'S HOME, CALL ATTENTION TO PAY LOST THROUGH ABSENCE FROM THE JOB

DUMMY CHECKS AND LETTERS HELP CONTROL ABSENTEEISM

DIXON HUNT • DIRECTOR OF INDUSTRIAL RELATIONS, THE BARDES FORGE & FOUNDRY COMPANY, CINCINNATI

WHEN post-war absenteeism became acute in our small foundry, we first attacked the problem by posting on a central bulletin board the number of men absent each day. The banner at the top of the poster read, "You did these men's work today."

Initially, the results were good. The absentee rate dropped from a high of 12 per cent to 3 per cent in the first month. The rate remained between 2.5 and 4 per cent for the next three months. But then it began to climb again.

Investigation showed that the "group pressure" that had worked so well at first was beginning to lose its effect. So we decided to give the program a boost by personalizing the appeal. It is never difficult to appeal to a man's pocketbook, and that is exactly what we did.

We added up the number of days each employee had been absent since the first of the year, and then we made out a dummy "check" representing the number of dollars the man had failed to earn because of absence. This "check" was mailed to the employee's home —where his wife and family would be sure to see it—with a letter emphasizing this message: "Being absent costs *you* money."

The effect was immediate. But this time we had no intention of letting it wear off.

Rather than limiting ourselves to a "one shot" proposition, we determined that *every week* we would send to each employee absent one or more days a dummy "check" representing the difference between his full-time rate (what he should have earned) and his actual earnings.

The letter that accompanies these weekly "checks" is reproduced in full at the left.

We recognize that a certain amount of absence—because of illness and other legitimate reasons—will always be unavoidable. And we recognize, too, that our present attack on the problem may never bring us to that unavoidable minimum. But we think we are coming close. In April and May of this year, months that can usually be counted on to have a high absentee rate, we had reduced ours to 2.25 and 2.10 per cent, respectively.

Dear Bill:

I am sorry to see that you were absent for two days this week. Maybe you had a good reason for not coming in – something that couldn't be done any other day, or perhaps you were sick. I certainly hope it wasn't because you didn't feel like working and just decided to lay off a day.

I am mailing you this "check" for the amount of money you lost by not working every day this week. Just stop and think what you could have bought with this money if you had earned it. It might be just what you need to help pay the rent or food bills. Maybe you could have saved some of it or bought one of those little extras that make life more pleasant.

Don't forget, YOU COULD HAVE EARNED THIS MONEY. The next time you don't feel like coming in to work remember what it cost you this week.

Remember–BEING ABSENT COSTS YOU MONEY!

Sincerely,
Alex Barczak
Alex Barczak
Executive Vice-President

LETTER to employee absent during week accompanies "check," emphasizes personal appeal

Mass production methods speed power-unit subassemblies . . .

to the end of the line where they

NEW LAYOUT AND HANDLING

Portable storage conveyors also provide a buffer which minimizes interruptions to normal production flow

WILLIAM J. PERRIE • PRODUCTION MANAGER, TRANSPORTER DIVISION
AUTOMATIC TRANSPORTATION COMPANY, CHICAGO

NEW LAYOUT, improved storage facilities, and the introduction of mass production techniques have combined to produce a 72 per cent saving in labor in the building of Automatic Transportation Company's transporter, stacker, and tractor in its Chicago plant.

The additional saving of 50 per cent in floor area has permitted a corresponding increase in production without costly expansion of the physical plant.

The power unit assemblies are produced as they move progressively around a *U*-shaped assembly line. When completed, the units are carried by overhead rail conveyor with power hoist to individual assembly boxes, where they are joined with the chassis.

Under the old set-up, the power units were assembled on what amounted to a job shop basis. Individual employees made the entire assembly, from start to finish, on hand-push dollies. As units were completed, the dollies were pushed to frequently remote points where the units and truck chassis were assembled. This method consumed excessive floor area, was costly and fatiguing.

Assembly Lines Installed

First step in the improvement, obviously, was to subdivide all work in such a way as to permit the establishment of assembly lines wherever it appeared possible to do so.

In the case of the power unit, the

roll onto movable storage conveyors . . .

or are assembled directly

CUT LABOR COSTS 72 PER CENT

mass production technique is now used 100 per cent.

The assembly moves around a *U*-shaped slide-rail conveyor. All of the actual assembly work is performed on the first two sides of the *U*. The final arm of the *U* is used for storage of completed units.

Moved by Conveyor

From the end of the slide-rail assembly line, units are moved by overhead rail conveyor with power hoist to points of assembly with truck chassis. However, to prevent costly delays caused by shortages of material or possible breakdowns of equipment, four sections of slide-rail conveyor have been mounted on casters. These sections can be moved into position at the end of the assembly line so that units not immediately required on the floor can move right onto them. This arrangement permits building up a small bank of power units during periods when production exceeds floor requirements. Conversely, when floor requirements exceed the momentary rate of production of power units, the bank is available to be drawn upon.

Convenient Storage

The four movable conveyor sections have a capacity of 20 units, and can very conveniently be stored in the "open" part of the *U*. The result is minimum interruption of production at all times, and the maximum utilization of the available space.

The photographs accompanying this article, as well as the foregoing description, have tended to emphasize the power unit. While this has been an important element, the over-all savings could not have been achieved without other changes being made at the same time. Typical were the provisions made for producing many subassemblies, such as the controller, contactor, collector ring, and motor, away from the final assembly floor. Additional credit, of course, is due the new incentive system of worker payment, and the many design changes introduced in the new model.

HOW COMMUNISTS MOVE IN ON A UNION . . .

1. Three Communists – seldom more – get orders from headquarters to organize your factory. They apply for jobs, are hired, rapidly complete study of factory and its key personnel.

2. Trio starts rumors against management, foremen, and perhaps certain union officers. Pet gripes are magnified, key officials slandered, small situations exploited to stir up dissatisfaction. Leaflets or copies of a small plant newspaper "written by and for the workers of Blank, Inc.," preach one or more of the Party's lines, as bent to fit the situation of the particular moment. Management has a continuing headache ahead.

3. Party wins recruits from plant staff as skillful missionary work takes effect. Some go on to become full-fledged Communists. Others, as fellow-travelers, can be counted on to back the official line, are generally sympathetic to the Party's objectives. Prospects are talked to, given books and pamphlets, invited to meetings of one or another front organizations. Ex-Communists, former members of International Workers Order, Young Communist League, and front groups, are contacted by trio and lined up for further activity. The cell grows steadily.

4. Leaders acquire reputations as "militant trade unionists." Able and experienced, they have little trouble winning posts as shop stewards, or maybe as editor of legitimate union's paper, an influential position. They work long hours, give "everything they've got," build up splendid records as candidates for office in the local. Never mind if the chore for the local takes extra work at night, pays no salary. The Communist gladly serves.

5. Directed by Communists, leftist faction begins to make its weight count at union meetings. One or more labor officials may be singled out for systematic badgering. Victim begins to look like a fool or "company man." "Points of order," challenges to rulings of the chair, points of personal privilege, amendments to amendments, all hamstring the meeting, bore honest members to the point of leaving.

The Red Menace in Labor

"SURE, you can get the Communists out of organized labor. But it won't be easy and it'll take time. To do the job, companies and unions are going to have to lay aside some of their animosities and get together on the problem."

FACTORY's informant, a former Communist, union official, and wartime FBI agent in Detroit, is today the owner of a furniture store in New York. His knowledge of the Party and how it operates in trade unions goes back to 1931.

"Mind you," he went on, "I'm not hopeful that this will be done. Management generally takes the attitude that the Reds are labor's responsibility—exclusively. And if a company does jump into the scrap, the union gets sore and shouts about 'interference in our affairs.'

. . . AND TAKE OVER

With majority of members gone, Communist-led group swings enough weight to vote through one or more resolutions – or decisions for union action – along pre-arranged Party line.

6. Campaign to discredit non-Communist union officials grows in intensity as election nears. Plausible charges assert openly that certain union officers are "company stooges." Their personal faults, real or trumped up, rate a smear of rumors. Denials are hooted at or denounced as "red-baiting." Meanwhile, C.P.-backed candidates are given every aid possible. One or more union officials are elected by Communist faction, henceforth follow Party bidding.

7. "Mission successful," Communists report back to headquarters. They now strongly influence, probably will soon dominate, local union. Management soon finds labor relations degenerating. Bargaining gets tougher. Grievances, temporary slowdowns, efforts to usurp management functions, begin to mount. Strikes increase. Members face uphill fight to recapture power.

LEFTIST UNIONS TODAY

Communist power in CIO has declined from the highwater mark it reached during World War II and just afterward. At that time, all the unions listed below were either strongly influenced or dominated by members with Communist objectives. As a result, of course, a great many local unions affiliated with them were similarly affected.

An official at CIO Headquarters, Washington, D.C., recently rated these unions for FACTORY:

NAME OF UNION	STATUS
American Communications Association	No change
International Fur & Leather Workers	No change
International Union of Fishermen & Allied Workers of America	No change
Mine, Mill & Smelter Workers	No change
International Woodworkers of America	Changed
Marine Cooks & Stewards Association of the Pacific Coast	No change
National Maritime Union of America	Changed
State, County & Municipal Workers Union	No change[1]
Transport Workers Union of America	Changed
United Canning, Agricultural, Packing & Allied Workers of America	No change
United Electrical, Radio & Mechanical Workers of America	No change
United Farm Equipment & Metal Workers	Doubtful
United Furniture Workers of America	Doubtful
United Gas, Coke & Chemical Workers	Changed
United Office & Professional Workers	No change
United Packinghouse Workers of America	[2]
United Shoeworkers of America	Doubtful

1 — A substantial number of members, CIO headquarters says, are currently trying to break away from the parent group.

2 — Situation still confused following Packinghouse Workers' unsuccessful strike last spring. Right and left factions are struggling for union control.

and How to Fight It

"The fact is, few people in management, labor, or any other group are real authorities on the subject. I've watched Communists out-maneuver companies and unions for years. They're still doing it today. Simply because they know the opposition inside out and plan their tactics accordingly.

"The defense against Communists—in labor unions and elsewhere—must start with a reliable fund of knowledge about them. They work hard. I know how hard. But they aren't supermen. They make mistakes. They have rivalries and jealousies, weak and strong points.

"However, you can't succeed against a Communist until you're educated in Communist ways—and means. To my mind, that's the crux of the problem."

Obviously, no article or series of articles can distill

such an education into cold print. All this report can hope to do, therefore, is to point up the need for such knowledge by illustrating, from the record:

1. What leftist leadership did to two unions, and the repercussions on the companies involved.

2. How Communists make use of management's mistakes to gain power in unions.

3. How honest labor leaders lose control to the Communists.

Also, some suggestions are offered as to how labor and management, working singly and together, can help rid unions of officials who are outright Communists or follow the Party line.

How Communist Leadership Destroys Unions

A good instance of what Communist leadership did to a union was related, several months ago, by Anne Matthews, a former member of the Communist Party, and, for a year and a half, recording secretary of Local 22, Food, Tobacco & Agricultural Workers-CIO, at Winston-Salem, N. C.

Appearing before the Un-American Activities Committee, she testified that the left-wing officials of this local repeatedly paid out union funds to Communist and Communist-front organizations. Such contributions, she said, were approved by the group's executive board and never submitted to the membership at large.

The same tactics were used in adopting resolutions which fitted the Party line. One of these, Miss Matthews testified, urged the government to withdraw troops from China. Another attacked General Smuts, then premier of the Union of South Africa. These were only two of several. In each case, the 8000-member local was put on record as approving something it had not voted upon.

A co-worker of hers, Eugene C. Pratt, former business agent of the local, described a later stage of developments. The union had struck against the R. J. Reynolds Tobacco Company. The firm's management said, in effect:

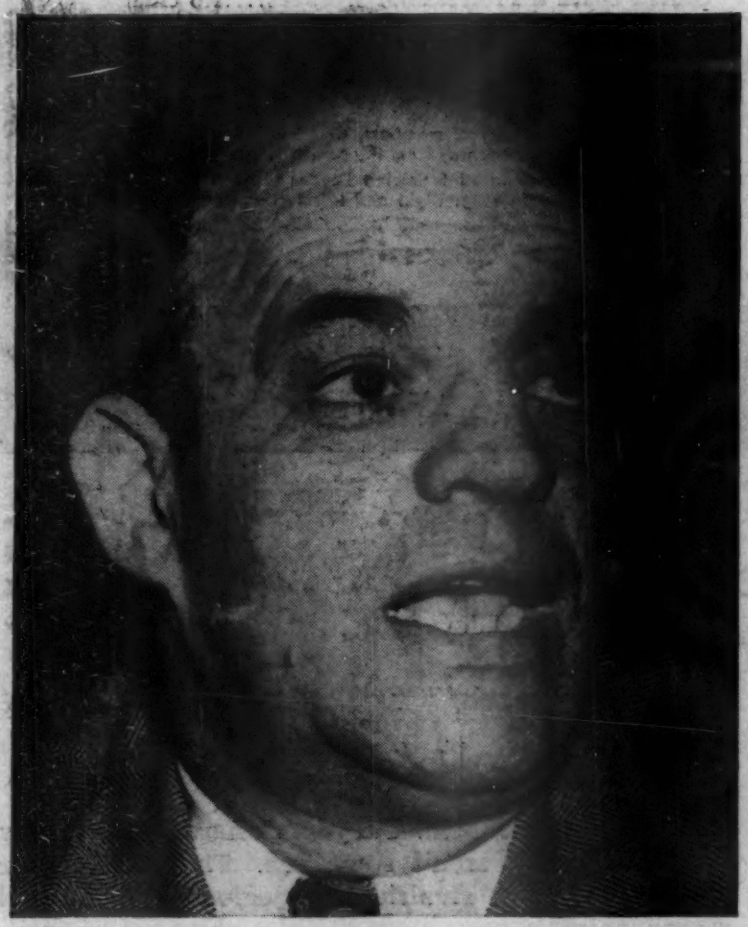
"Get rid of your Communists and then we can talk."

Pratt, never a Communist, left town to see President Philip Murray of the CIO, and the union's vice-president, Alan Haywood.

"I told [them] the company's objection to dealing with the organization was because of the Communists, and that, if this objection could be removed in some manner, the company would do business with the union and take these people back to work—off the street—with a reasonable settlement.

"Mr. Haywood asked, 'What will be the outcome if the objections of the company are not removed?'—or the Communists are not removed, I will put it that way.

"I said, 'In my opinion, the company will continue



CURRAN CLEANED HOUSE . . .

NMU's president told FACTORY: "If a Communist has to choose between the Party and the union, the Party wins every time. We demonstrated that here"

SO DID REUTHER . . .

Asked how he licked leftists in UAW, Reuther said: "It is not enough just to buck them. You've got to have a positive program—then work as hard as they do"

to hire until they have a full complement of personnel and allow the strikers . . . to continue to walk the streets.'"

Turning to Murray, Pratt continued, he emphasized that these people "were entitled to consideration; they had been paying their dues to the CIO. They had a right to look for protection to the union and not to the Communist Party.

"He agreed with me," Pratt testified, "and then replied, 'Mr. Pratt, it is a big job. I am not God. I am a small potato in a big sack.'"

Result was that Pratt returned unsuccessful, a mass "demonstration parade" was organized and run off by the Communist leaders of Local 22, and, as advertised clearly beforehand, the police broke it up. But it was a field-day for the Communists who commanded the strikers. They had warned the membership that the police were "tools in the hands of the bosses" the day before, at a mass rally, and they were now able to say, "I told you so."

It was a clear win for the Communist leadership. But to the union—which became a shell as the strike dragged on—and to the workers, who had no jobs, and to the company, which lost money and production throughout the weeks-long strike, it was a different matter.

Even more spectacular was the success of the Communists who dominated Local 248, United Automobile Workers-CIO. This, of course, is a famous case—the strike at Allis-Chalmers Manufacturing Company, West Allis, Wis. The men were out from April 29, 1946, to February 8, 1947.

Company officials estimated the strike cost Allis-Chalmers $70,000,000. Wages lost amounted to $18,240,000. And the membership of Local 248, more than 8000 at the start of the strike, dwindled to a few hundred.

Virtually all the controlling officials of the union, from Harold Christoffel, the honorary president, on down, were either Communists or followed the Party line. The record is incontrovertible.

(Since that time, Local 248 has been reorganized along honest trade union lines and is today well on the way to complete recovery. But it cost the men, and the company, very dearly.)

Eye-Witness Testimony

Perhaps the most ironical fact of all in the Allis-Chalmers case was the way top union officials conducted the strike vote. Let it be described by an eye-witness, Leon E. Venne, one of the charter members of 248:

"We waited for 20 minutes and the crowd came. . . . After they were all in the meeting, the doors were closed, the gates on both ends of the fair park were closed.

"Robert Buse [president of 248] took the platform and made the statement that, of course, you all know why we are here, we are here to conduct a strike vote; all in favor of holding a strike vote will vote aye. There was a scattering of ayes. A couple of members rose on the floor to speak on the issue, but Buse wouldn't hear of that."

Venne, testifying before the Thomas Committee, was asked whether a negative vote was called for. He said "No."

So the vote was taken. There were too few polling booths to accommodate the 4000 voters, and they

Wide World Photographs

. . . BUT FITZGERALD STILL RUNS HIS UNION TO SUIT LEFT-WINGERS

No Red himself, UE's President Albert Fitzgerald (center) consistently guides union down Communist line. Real bosses of UE are James J. Matles (left), director of organization, and Julius Emspak (right), general secretary-treasurer. UE is last large stronghold still controlled by left-wingers. Most UE locals are leftish, too

weren't private. Venne said he himself—like hundreds of others—marked his ballot on the back of the men in front of him.

"Then," he went on, "the ballots were placed in cardboard boxes, sealed with adhesive paper. The boxes were taken to the union offices, and Buse made the statement from the platform that no union members would be allowed in the union offices that afternoon. I went over to the offices that afternoon. The windows were closed and the shades drawn. The result of the balloting was made known through the press."

"This was something like 8500 for strike action and 251 against. I myself," Venne stated, "have contacted more than 251 men who voted *no*."

Such cases, among many, give force to the remark Joseph Curran, president of the National Maritime Union-CIO, made recently to FACTORY. As a union official who finally cleaned out the Communists—after years of sub-surface warfare—he knows what he's talking about.

"Communists and fellow-travelers," Curran said, choosing his words carefully, "are not genuine trade unionists. They place the economic welfare of the members second to the Party's. If a Communist has to choose between the Party and the union, the Party wins every time. We demonstrated that in the NMU."

How Management Errors Strengthen Red Hands

Does Communist influence—or domination—in a union adversely affect the company that the union deals with? The answer is pretty obvious. In the examples cited above, both Allis-Chalmers and R. J. Reynolds were forced to take heavy losses in strikes that need never have occurred. And once the strike has occurred, the left-wing leaders drag it out as long as possible. Men get bitter after weeks and months on a picket line. They believe what they hear about the "exploitation of the masses" and the "ruthlessness of bosses." Communists make sure they hear plenty.

Financial losses, personal resentment, and (if the Communist leaders play it right) growing confidence in the top union officials who have stuck by the men—these things are money in the bank to members of the Communist Party. They are the stuff of which recruits are made. They are, even more important, a few more barbs driven into the American system of individual enterprise. Drive enough of them, leftists reason, and sooner or later they will prove fatal.

Perhaps this was what Lenin meant when he said, "No strike is ever lost."

Most executives realize, in fact, that where a company is dealing with a Communist-influenced union labor-management relations are substantially more difficult than they would be normally. One would probably look in vain for a company official who, having had experience with both Communist and non-Communist union leaders, prefers the former.

No doubt it would be just as hard to find an executive prepared to admit that his company had given aid to Communists seeking control of the union his firm deals with. Yet the evidence is unmistakable that this *has happened* in the past. It *is happening* today. *It will continue to happen—until management builds up an intimate knowledge of how leftist labor leaders operate.*

Some examples:

The great majority of companies that have left-wing unions continue to deal with them, have elected to renew their contracts. (See page 107 for a list of such unions.) The leaders of these unions have not signed non-Communist affidavits. There is, therefore, no legal requirement to negotiate with them.

Can anyone doubt that non-Communist members of such unions draw the obvious inference? "If the company doesn't object when the Reds run the union, why should I struggle?" Obviously it is only the non-Communist membership that can vote the Communists out of power.

In this connection, it is interesting to note the experience of one company that *did* have the courage to break a Communist-dominated union—Remington-Rand and the United Electrical Workers-CIO. The UE is recognized as one of the largest and most powerful organizations affiliated with the CIO. Its leftist leanings are well known. None of its officials has filed a non-Communist affidavit.

What happened when Remington-Rand said: "Comply or we won't negotiate"?

UE tried to pull a strike, but, being denied the requisite NLRB voting facilites, could not do so. The company is functioning normally, and has been since management made its decision.

Or take the case of a top-level executive of a large department store in New York City. He recently testified before the House Labor and Education Committee that he was sure Communists controlled the local union his firm deals with—Local 65, Retail, Wholesale & Department Store Union-CIO.

A few days later, the company and the local signed a new contract. It included provisions for deductions for a union "fighting fund," and for subscriptions to the "Union Voice," Communist-line publication of the left-wing locals. However, the most important concession won from the management was contained in the so-called "Reciprocal Discharge Clause." By it, the company *and the union* may fire an employee within a month of the time he or she joins the staff.

Clearly, such a clause delegates some of management's basic functions to the union, and was so criticized by other department store officials negotiating with Local 65. Moreover, the clause hands a powerful weapon to the leftist union leaders to keep non-Communists in line. Again the inference is obvious: "If the store won't stand up to the Communists, why should I, a $40-a-week clerk stick my chin out?"

Inconsistent Policies Dangerous

Occasionally, too, management makes the mistake of taking one attitude toward a union run by honest labor leaders and a quite different one toward a union dominated by Communists. Such was the case with an electric appliance firm in Northern New Jersey. It held contracts, at the time, with the International Brotherhood of Electrical Workers-AFL, and the limited Electrical Workers-CIO. The first group signed a contract for an 8-cent raise across the board. UE officials, however, talked and acted tougher, received 11 cents shortly after the IBEW negotiations were completed.

UE leaders were quick to drive home the lesson to IBEW members:

"We are better bargainers than your officials. Join up with us."

There followed some months of bitter inter-union struggle in which UE was eventually the victor. Now the appliance company deals exclusively with UE, a situation the management has cause to regret. Giving the non-Communist union leaders an even break would have strengthened their hands greatly.

Instances such as these are not exceptional. They keep right on cropping up. Added together, they make convincing evidence that management must turn to and educate its people in the tactics of Communist labor. Executives will find that non-Communist elements in a union cannot always be aided. But an educated and alert management can avoid hindering them.

How Union Blunders Lead to Red Domination

The unions have made similar mistakes. Through ignorance, short sight, apathy—even, on occasion, outright treachery—non-Communist union officers have lost out to the Reds.

Back in 1939, Harley Box and Michael Mitchell simply didn't know how the leftists operate. They learned the hard way. At the time, the two men were running a local of the United Automobile Workers-CIO, located on the outskirts of Detroit.

The Communists had organized a voluble minority. They called loudly for tougher bargaining, presented their own schemes "for the workers" at every meeting, and systematically badgered the administration.

Box and Mitchell, in their innocence, tried to outshout the opposition. They changed goals of their program drastically. They argued hotly from the platform—and lost out in the heckling that followed. Whatever the Communists suggested, they gamely tried to go one better.

Elections were coming up in six weeks, and after that, the annual negotiations with the company. To Box and Mitchell the whole show was political.

That wasn't the way the company looked at it. Somewhat worried by the echoes reaching their ears, the management grew downright alarmed when a group of union members approached them privately.

Box and Mitchell, a spokesman asserted, were obviously a pair of crackpots. They were following the Party line in their program; there was wide suspicion that they were Communists. Furthermore, the two were planning a strike which would cost the firm thousands and wreck the local. It was time for the company and the union to get together.

So company executives and the union bloc mapped out a campaign. Grievances, Box and Mitchell found, were suddenly impossible to settle. Pamphlets kept turning up in the plant, filled with half-truths and downright lies. The management, never close to the union, embarrassed the administration at every opportunity. Box and Mitchell found themselves being discredited by the company on one side, the Reds on the other. Under this barrage, the membership swung over also, and the election was upon them before the two officers could get back on their feet. Needless to say, the Communists were in, Box and Mitchell out.

Thus the Reds, trading on the innocence of the men and the ignorance of the management, inherited an important UAW local.

Red Counterattack Successful

Leftists can counterattack effectively, too. When they were voted out of office in one CIO local, they wasted no time in tears or recrimination. Instead, they set out to split up the seven-man team that had succeeded them.

New to union politics, the team was out-generaled from the earliest stages. Three of its members sought bigger appropriations for their departments. This smelled somewhat suspicious to the others—and looked like crass featherbedding to the membership. The Communists had a wonderful time.

Then the union secretary, too idealistic for his own good, was induced to compromise on a Red-backed resolution. As time went on, he was skillfully separated from the main group. Somewhat later, the ambitious vice-president of the local was secretly approached and offered the backing of the Communist machine. He accepted, and a new and disruptive factor entered the governing council of the local.

That was the beginning of the end. By the time the team took the stump again, its unity was gone—splintered by the keen thrusts of the opposition. The Reds rode back to power. One more illustration was added to show the potency of a political chestnut—*divide and conquer.*

Sometimes it is not ignorance or apathy. The record shows a number of cases where non-Communists reached office—either on the local or international level—with the backing of the Party machine. R. J. Thomas, former president of UAW, and Richard Leonard, former vice-president of that organization, were two such.

Neither, intimates of the men agree, was a member of the Communist Party at any time. Leonard, in fact, was a capable anti-Communist when he was active in the DeSoto local back in 1937. Subsequently, he tried hard, on a middle-of-the-road ticket, to get elected to the UAW International Executive Board, but failed. It was a bitter disappointment.

Not long after this defeat, Leonard made his decision. He began following the Party line in UAW matters. With Communist aid, his rise was rapid. He held high office in the international union until Walter Reuther's sweep at the 1947 convention.

Thomas Toed the Line

R. J. Thomas accepted Party help on the same basis. No Communist, still he toed the Line throughout his terms of office. Less shrewd than Leonard in union politics, he was, in a real sense, a prisoner of his left-wing advisers. They set his policy, wrote his speeches, figured the angles. Thomas was less an executive than a figurehead.

They are gone from UAW. But Albert Fitzgerald, president of UE, now holds power as the president of the international union on exactly the same basis. No Party member himself, Fitzgerald is controlled in word and deed by his two leftist bosses, Julius Emspak, general secretary and treasurer of UE, and James J. Matles, director of organization.

Despite such depressing chronicles, it would be

wrong to leave the impression that Communist influence in trade unions is on the rise. Walter Reuther has cleared out all but a few small pockets of leftists in UAW. Joseph Curran gave a historic shellacking to Communists plaguing the National Maritime Union. Top CIO officials claim only two state councils are still under leftist influence—California and Washington. Meanwhile, as membership opinion has hardened against the Reds, CIO has taken issue more openly, and hence more effectively, all over the country, including the important councils in Michigan and Wisconsin. Iowa is next on the list, as this is written.

No less significant, CIO affiliates have ignored the siren call of Wallace and his Progressive Party. Only the out-and-out leftist unions have climbed onto that bandwagon. The trend in American trade unions is away from, not toward, Communism. But the process is long and slow.

Meanwhile the cost in needless strikes, slowdowns, mulcting of union treasuries for Party purposes, and in indirect expenses, runs into millions of dollars annually. How many, no one can say.

As an undoubted fifth column in time of war, in terms of sabotaged relations between employer and worker, in bitterness, violence, lies, and distrust, the price of Communists in labor is prohibitive.

How Management Can Help Unions Fight Reds

While the eventual responsibility for eliminating Communists rests with union memberships, and the men who lead them, management can help with the task. The time to start is now.

At this point, it would be timely to offer an anti-Red prescription which, followed faithfully, would provide a sure cure. Unfortunately, no such specific is on the market. But informed people, in and out of labor, have offered FACTORY their advice on the subject, based on the firm foundation of experience. Herewith a summary of their "Do's" and "Don't's":

Management Do's

1. Educate management people in the background and methods of Communist labor leaders. More than any other factor—except common sense—a well-grounded knowledge of Red union tactics will help an executive, at any level, to counter the opposition. Without such data at its fingertips, management is doomed to failure in this field.

2. Cooperate in every lawful way with anti-Communist elements in the union with which the company deals. The two groups can be mutually helpful without either side deserting its tenets. But make sure the anti-Reds are genuine. And be prepared to help quietly. Communists like nothing better than to identify their enemies as "company men."

3. Make absolutely sure employees are getting the facts about the company's operation—promptly, fully, understandably. They may often disagree with management's opinion, but they will respect it, and have faith in it, once convinced that the company is playing the game straight, all day and every day.

4. Use every possible means to settle gripes and grievances, especially the smaller ones. These bulk large in the minds of almost all employees and offer an ideal medium for Communists to work in. A disgruntled worker is fertile ground for Red propagandists. They know it and constantly exploit the fact.

5. Analyze the company's personnel program and policies. Are they fair by current standards? In the light of the knowledge of how Communists work in labor unions, do they hand the Reds any effective tools? If so a change should be considered.

Management Don't's

1. Don't be afraid to denounce the Communists in your union. A campaign using any and all mediums is probably a good idea. But avoid starting one during contract negotiations, a union election, or in times of internal crisis within the local. Such a campaign should be conducted factually, without heat or vindictiveness—and only if the evidence is unmistakable. Otherwise, it may backfire and make martyrs of the Reds, the worst blunder in the book. This weapon is effective when well used, but it can cut in both directions. Make it crystal clear that the company is out to smash the Communists, not the union.

2. Don't treat employees as a class apart from management, either during negotiations or at any other time. For one thing, they're not. For another, this is the Communist line—the bosses against the workers—and plays into their hands. An informal, friendly, straightforward relationship between the two groups should be a matter of basic management policy. Giving men concrete evidence that "you're on the team" is undoubtedly one of the best antidotes to Communist propaganda yet developed. Most companies still have a long way to go in this direction, judging from FACTORY surveys.

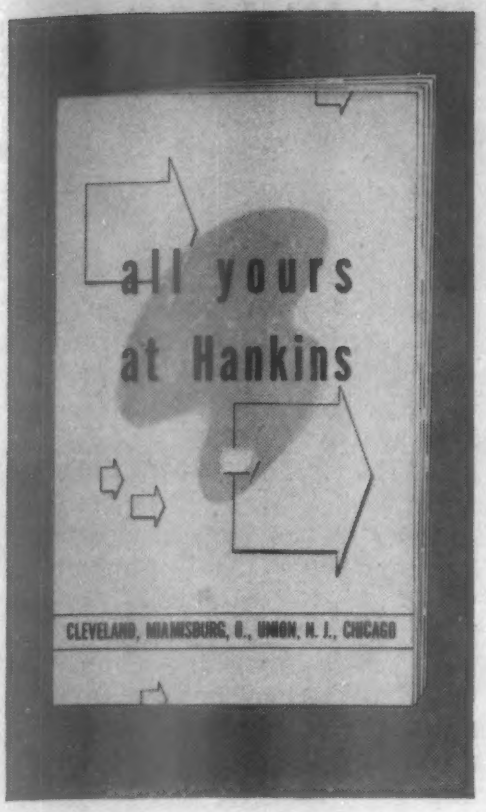
3. Don't overlook the essential role played by foremen and supervisors in this fight. As the representatives of top management best known to the great majority of employees, their effect on the opinions and attitudes the workers form toward the company can hardly be overestimated. They need solid instruction in Communist labor tactics and counter-tactics. The Marxist concept that "to capitalists, labor is a commodity" and not a group of human beings, is a lie which constantly needs refuting. Capable and informed supervisors and foremen can help immeasurably with that task.

4. Don't deal with a Communist-dominated union without searching hard for a practical alternative. If none can be found, make sure employees realize that unless their union officers sign non-Communist affidavits, they—as members of that union—lose three important benefits under the Taft-Hartley Law:

1. National Labor Relations Board won't hear and won't investigate petitions from the union to have a certain union represent them—or to cease representing them.

2. The name of their union may not appear on any ballot taken by NLRB to determine which labor organization shall represent the workers.

3. NLRB won't issue complaints against the employer, based on charges of unfair labor practices brought by the union.



ELIGIBILITY RULES FOR HANKINS' SECURITY PLAN
(determined by employee-management Welfare Advisory Board)

REQUIREMENTS:

All employees with 70 or more points automatically become members of the Security Group, and are eligible for all benefits.

Should less than two-thirds of the employees in any one Hankins' plant qualify under the "70-point" rule, the employees having the greatest number of points shall be selected in turn, until two-thirds of the employees at the plant are members of the Security Group.

ACCUMULATION OF POINTS	VALUE
Each year of service	2 points
Each month of perfect attendance	4 points
Each month of perfect punctuality	2 points
Each month absent one day	2 points
Each month tardy one day	1 point
If absent or tardy two or more days during month	No points

ILLUSTRATED BOOKLET EXPLAINS IN DETAIL THE BENEFITS AVAILABLE TO HANKINS EMPLOYEES WHO QUALIFY AS MEMBERS OF "SECURITY GROUP"

SHARE OF PROFITS GUARANTEES PAY, PENSIONS, AND BENEFITS

GUARANTEED opportunity for continuous work and guaranteed pensions are realities at Hankins Container Company, Cleveland. And those two objectives are but part of the over-all security plan currently in effect.

Both management and employees at Hankins realize that job security is not something that can be wished into existence; it must be earned. In recognition of this principle, exclusive control of the security fund has been placed in the hands of a welfare advisory board, on which the hourly workers have equal representation with management. By decision of this advisory board, participation in the security plan is limited in accordance with the formula shown in the box at the top of this page.

"Where does the money come from?" is always an important question in connection with employee benefits. Here is how it is done at Hankins. Before payment of dividends, 10 per cent of the company's profits are deposited annually in the security fund, which is held in trust by a bank. The terms of the trust provide that this fund may be used only to provide continuous employment, pensions, and various other employee welfare benefits.

At the present time, 10 per cent of the total payroll (less fringe expense) is set aside for the Christmas bonus, individual employees receiving shares in accordance with their point total and wages.

Money Ahead

As the fund is now set up, there is enough money to carry all qualified employees on a pay basis of 35 hours per week for a period of 3 years, on the basis of two-thirds normal operation.

Employees with 10 or more years' service are entitled to a pension at age 65. The pension amounts to 1 per cent, for each year of service, of a man's weekly pay rate at the hourly rate received just prior to retirement, plus or minus the cost-of-living adjustment (using January, 1946, as a base). A separate account is maintained for the pension, and there is at all times kept in this account an amount of money equal to the pension requirements after retirement. Thus, all currently pensioned employees have a guaranteed income for an average period of 15 years.

Other Benefits

Other benefits received by the employees include six paid holidays, vacations with pay, and free group insurance. Questions regarding possible additions to these employee benefits are entirely in the hands of the welfare advisory board, but questions regarding enlargement of this program have been kept to a minimum, because employees know that the more the company has to pay out for "fringe issues," the less will be available for distribution as a Christmas bonus.

That employees will at all times be fully informed regarding operation of the security plan and the point system, Hankins has prepared an indexed booklet describing all of the features of the plan in full.

WHAT THE F.O.B. RULING MEANS TO INDUSTRY

F.o.b. pricing of steel and cement may hit a few companies hard; over-all short-run effects will be slight

AN EXHAUSTIVE SURVEY of American industry by the McGraw-Hill department of economics has cleared away much of the doubt resulting from a series of Supreme Court decisions affecting delivered pricing systems. It is now possible to paint a fairly clear picture of the short-run effects of these decisions—and of the steel industry's subsequent abandonment of the basing point system. But the long-run effects are still far from certain.

What *is* the present legal situation, as regards basing points? Many legal points are still in doubt, and Lowell B. Mason of the Federal Trade Commission (government regulatory agency involved) goes so far as to say that in his opinion, the Court decisions outlawed:

1. Basing-point price systems.
2. Zone price systems.
3. "Postage stamp" (uniform delivered) price systems.

But other competent observers feel that future court rulings are likely to leave many basing-point pricing systems intact. And there is every indication that Congress will consider the matter next year.

Although the Supreme Court decision affected only cement directly, the steel industry acted almost immediately to abandon its basing point system in favor of f.o.b. mill shipments. *And the almost-simultaneous steel price-rise obscured the import of the basing point ruling.*

Short-Run Effects

Because of its importance to all other industry, steel is a prime example for considering the short-run effects of the new pricing system. Evidence gathered in the survey indicates that, with minor exceptions, most other commodities will be affected less than steel.

One hard fact emerges:

The immediate, short-run effects of the steel's shift to f.o.b. are slight, economically. True, some companies may feel major effects in the very near future. In general, however, the new pricing system will not affect the competitive position of more than a small minority of steel users. *Major markets, locations of plants, and competitive positions of the vast majority of companies will not be revolutionized.*

In examining *why* the short-run effect will be slight, four factors stand out:

1. *Excess demand for steel.* Today, steel can sell every ingot it can make—and more. While that condition continues, effect on the steelmakers will be small.

2. *Small cross-haulage.* Only 10 to 15 per cent of all steel was shipped from other than the closest mill (the basing-point, from which freight was paid). In other words, the switch to f.o.b. will mean a hike in the delivered price of only 10 to 15 per cent of all steel purchased.

3. *Location of competitors.* Where geographical considerations affecting supply and distribution cause competitors (each seeking the best location) to concentrate in a limited area, they will have to absorb roughly equivalent increases as a result of the new pricing system.

4. *Small cost of freight.* In most cases, extra freight will be less than 10 per cent of the cost of steel. Add this to the fact that steel itself may be no more than 10 per cent of the cost of the product, and the resulting competitive disadvantage would be no more than 1 or 2 per cent.

Exceptions were noted to three of the four factors above. The company that finds itself in the "exception" class could be in for some tough sledding—especially if a buyers' market develops. But for the others—the vast majority—there is no cause for alarm.

Long-Run Effects

Long-run effects may be much more important—particularly in the steel industry. But until many legal points are clarified, there will be less than agreement as to the future.

There is no argument, however, that a depression, in which steel operations dropped to, say, 65 per cent of capacity, would spell trouble. Here is why:

Pittsburgh-Youngstown and other areas have a "surplus" steelmaking capacity, when measured against local markets. Curtailed operations would mean everybody buying from the nearest mill. And with today's high breakeven points, that would be serious in the "surplus" areas. If price cutting were to start, it might affect the competitive position of consumers, too. Certainly the competition to get business would be intensive, might wear down some steel companies, and might retard the progress of the entire industry.

Industry Migration a Help

As an offset against such a possibility, the continuing migration of industry will bring local markets into better balance regarding steel supply and demand. And many observers believe the U. S. economy is geared up so high that it may never slip back to levels low enough to cause serious trouble. *In any case, no one can spell out with certainty the exact potential developments of the shift to f.o.b. pricing.*

★ ★ ★

So far, steel and cement have been the commodities principally involved in the change from basing-point to f.o.b. pricing, although many individual chemical companies have begun to charge freight to their customers in order to avoid general price increases.

Many other companies recognize the possibility that their pricing systems may be affected by the new rulings, but they are awaiting clarification by the courts or the Federal Trade Commission (or both) before they change. Leading companies in the pulp, glass, sugar, electrical, and chemical industries are among these.

And not to be overlooked is the fact that a great many companies are not affected at all, and never will be, because they have been using f.o.b. pricing for some time.

1. STEEL SHEET is usually shifted by fork trucks, either with or without trailers. After cutting to size, sheets are stacked on skids for delivery by fork trucks to presses for forming operations. High skids help keep sheets at convenient height for the operators to hand feed them to the presses.

LINE FLOW REQUIRES ONLY FIVE DAYS' SUPPLY OF PARTS

H. F. CLAAR • PLANNING AND SCHEDULING SUPERINTENDENT
INDIANAPOLIS DIVISION, F. L. JACOBS COMPANY

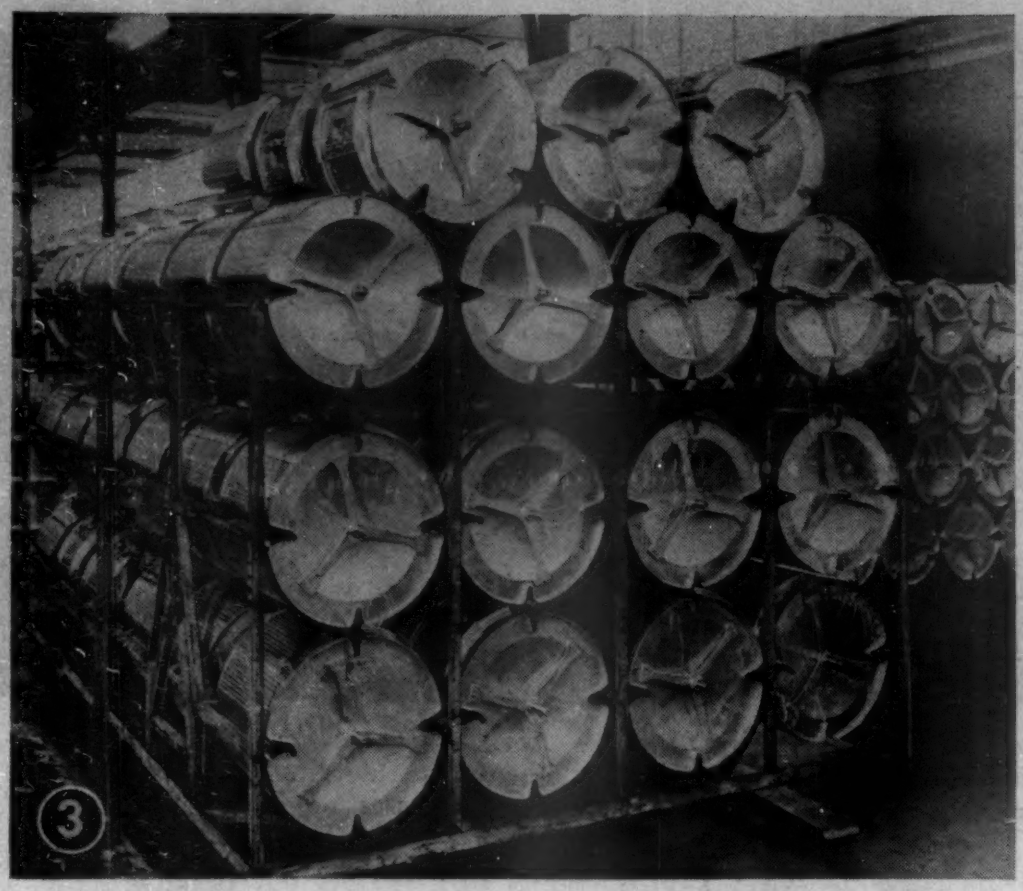
SEVERAL types of conveyors supplemented by fork trucks, trailers, cranes, electric hoists, elevators, and turntables, keep materials and products moving from incoming toward outgoing sidings in the new plant of the F. L. Jacobs Company, in Indianapolis. Everything within reason has been done to insure continuous and smooth flow at low cost.

Stocks seldom exceed five days' supply. Scheduling and handling so well ordered that finished products issue in step with receipts; hence a minimum inventory is carried. This rapid and continuous turnover is, in itself, conducive to economy. It also necessitates close coordination and continuous operation of the entire manufacturing set-up. Thus idle time is cut, because each operation keeps pace with the general processing rate.

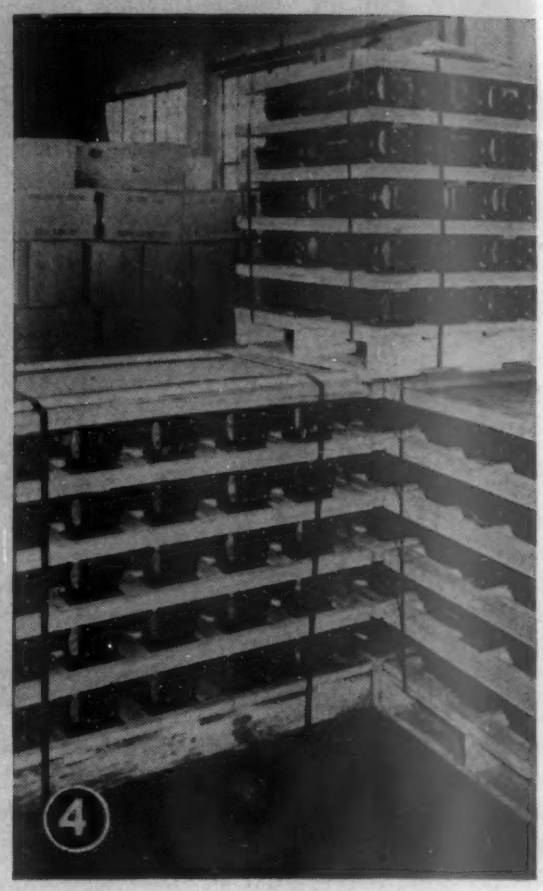
This plant fabricates many parts for and assembles the "Launderall," an automatic domestic washing machine, and two sizes of dispensers for bottled soft drinks. The accompanying photographs show the washer assembly only, but the dispenser is handled in similar fashion on a separate assembly line. Some presses and other equipment are arranged, however, for alternative use on either product.

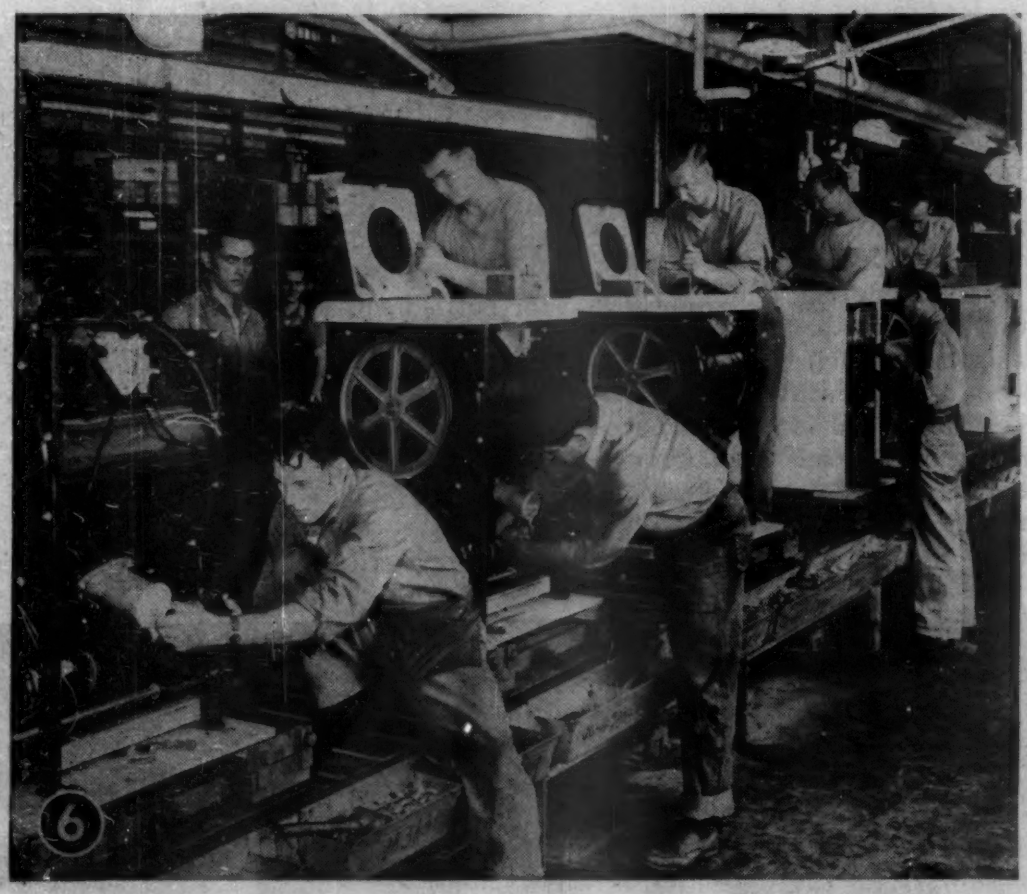
(CONTINUED ON NEXT PAGE)

2. PANELS, after being formed are loaded on hooks of a chain conveyor, which takes them to metal finishers. They are then returned to the conveyor for delivery to a bonderizing set-up in which a rust-resisting coat is applied. In the enameling department, the chain carries panels through spray booths and drying ovens as well as through the inspection area. After the second coat is baked and panels are cooled and inspected, they are shifted to another chain that feeds the final assembly line.



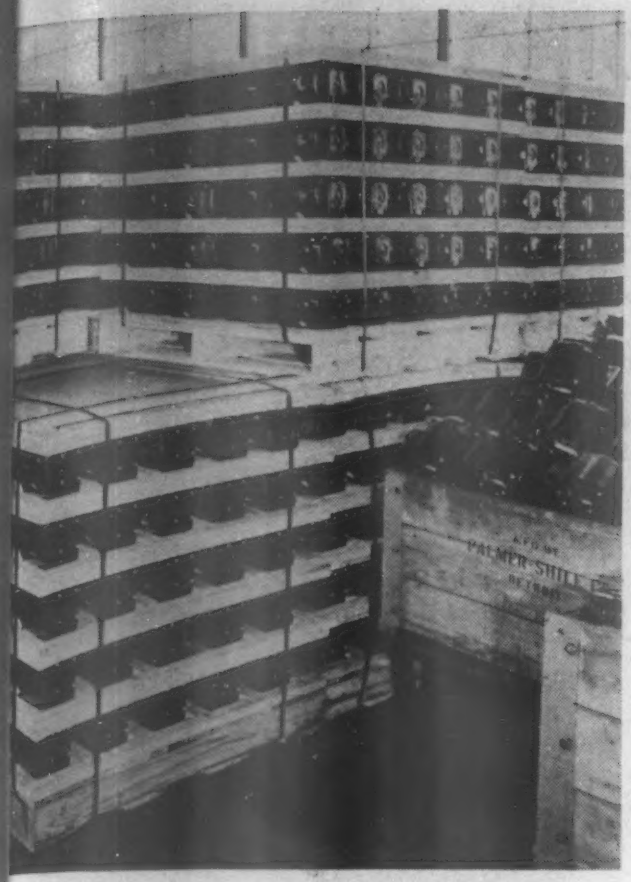
3. COMPONENTS assembled in feeder plants are transported by highway trucks in several types of castered racks, eliminating the need for cartons or other packing. Such racks reduce handling of individual components, and result in a big saving in packing expense. The racks are easily shifted from trucks to spotting points along the final assembly line or to feeder chain loading areas. When emptied, the racks are carried back to feeder plants on the return trip of the truck. Other parts, such as transmission-pump assemblies, are received on skids, which are stacked five high for temporary storage. The bottom skid is provided with feet in order to facilitate handling by truck.





6. ACTUAL ASSEMBLY takes place on a slowly moving slat conveyor. Supplies of small parts are kept in fixed bins attached to the conveyor frame; the bins are refilled each night while the line is shut down. (Similarly, most heavy trucking is limited to the third shift.) The overhead conveyor shown in Figure 5 parallels this line at a distance of about 3 feet. It was necessarily empty at the time this photograph was made to permit full view of the assembly operations.

7. FOUR TURNTABLES, similar to the one shown, are used for the 45-min. actual washing test each washing machine must undergo to insure correct functioning through a full cycle of operation. Here, all final adjustments are made and, when



4. ELECTRIC MOTORS arrive either on wooden pallets, banded together in stacks or pallets, or in cartons. The first arrangement is preferred, because it saves unpacking cartons and individual handling of motors into toteboxes for delivery to final assembly. Pallets are returned to suppliers for reloading.

5. OVERHEAD CHAIN CONVEYOR that feeds the final assembly line passes through a live storage area where crate bottoms and the various components are hung on hooks in the order in which they will be required for assembly. Crate bottoms, which are shown stacked in background, serve as the bases on which washing machines are built up on the final assembly line.

the test is completed, each machine arrives at a roller conveyor and is pushed onto it for advance through touch-up and inspection to packing.

8. TUBULAR PORTIONS of shipping crates are taken from skids spotted along the roller conveyor and are slipped over the machines. This part of the crate is then nailed to the crate bottom, and a top section, also from adjacent skids, is applied and nailed on. The crates, with contents, weigh about 500 pounds, but are strong enough to permit stacking four high. An electric hoist on a trolley is used to shift crates onto fork trucks which carry two crates, one above the other, into freightcars at sidings or into trucks at outgoing docks.

"FOREMAN'S UNDERSTANDING" BUILDS

"When you realize the other fellow is a human being, I guess you just naturally treat him like one"

That's the essence of the "understanding" program which takes the place of the usual training at Revere Copper & Brass. Here's a new approach to the "foreman problem"

CARROLL W. BOYCE • ASSOCIATE EDITOR, FACTORY

TRAINING a foreman is a job for his immediate superior, not for the personnel manager or some 'front office' representative." That is management's view at Revere Copper & Brass Incorporated, Rome, N. Y.

John Eikenberg—who rose from mill worker and foreman in the company to vice-president of industrial relations—believes that a foreman is likely to resist, unconsciously perhaps, any attempt at "training" by men who cannot command respect by being able to "step up and do the job." And Eikenberg admits frankly that even men up from the ranks quickly lose the "mechanical skill," or "touch," that makes a top on-the-job foreman.

So this is the task that the Revere industrial relations department has set for itself:

1. To make available *information* which will enable the foreman to understand top management and its problems.

2. To make available *channels of communication* which will enable top management to understand the foreman and his problems.

Understanding is the key word in each of those objectives; "Foreman's Understanding Program" is the all-inclusive name for the "training" activities at Revere.

The program is not a two-week or even a two-year undertaking. Indeed, it is as much an attitude as anything else. But if the program may be said to have had a "first step," it was to sell top management in each of the company's divisions on the need for taking foremen into the management circle to a greater degree than is common industrial practice. *All the way in.*

How to accomplish this was not a simple matter. First it was necessary to answer the question, "What makes a foreman feel that he is, in fact, part of management?" To get answers, Revere asked its foremen.

Close to 500 foremen were interviewed by the industrial relations manager. Interviews were private, informal, and strictly confidential. The purpose was to provide concrete evidence of the acceptability of policies on which a program of foreman understanding could be built.

No "stock" questions were asked. No questionnaire was filled out. The foremen were simply given an opportunity to "write their own program" for becoming better foremen, better members of management.

What the Foremen Wanted

Analysis of the interview results, in the usual sense, was impossible. But it was found that almost 75 per cent of these men felt that there were five definite factors in the picture:

1. *Greater acceptance as management personnel.* Foremen felt that some of this, particularly from superiors, should (and did) come as a matter of course. But there was almost general agreement that greater acceptance must be *earned* by doing a better job. In other words, the underlying desire was not so much for greater acceptance as for the "tools" with which to earn it.

2. *Interpretation of company policies.* Inability to interpret correctly some company policies was causing some foremen to do less than what they felt was the best job of which they were capable. And the foremen found it an acute source of embarrassment when they were unable to interpret correctly policies affecting their men or departments.

3. *Greater knowledge of "what's going on."* Foremen sometimes found themselves in the position of getting the first word of a new development from a steward, or from one of his men who had been told by a steward. On other occasions, foremen did not fully realize what was expected in the way of interdepartmental cooperation.

4. *Meetings to insure flow of information.* The desire for such meetings, at both confined and general levels of management, was a natural outgrowth of the second and third points above. However, the foremen wanted the meetings not only as a channel of communication and interpretation *down the line,* but also as a channel through which they might discuss their problems *up the line.*

5. *Promotion of "human relations" within the company.*

What Was Done About It

Upon examination of these points, management determined that there were some superficial things that could be done at once to give foremen a greater feeling of acceptance as part of management, but that, by and large, this feeling would have to result from action taken along the other lines suggested. However, in recognition of the demand, the company immediately issued to all foremen identification cards inscribed. *"This card will introduce* Mr. John Smith, *Management Supervisor, Revere Copper & Brass Incorporated."*

It is impossible to consider entirely separately the parts of the program affecting the second, third, and fourth points, but broadly this is the way in which the problem was approached.

BETTER MANAGEMENT TEAM

An initial step in helping the foremen with the interpretation of company policies was the preparation of a loose-leaf booklet, "The Foreman's Guide." As originally issued, it contained six sections:

1. Definition of supervision, including functions and responsibilities of various levels.

2. Definition of labor legislation; names and coverage of various laws.

3. Analysis of labor legislation affecting Revere; emphasis on problems relating to foremen, and questions foremen may be called upon to answer.

4. Explanation of the company's collective bargaining situation, and an analysis of the current union contract.

5. The industrial relations department; what it is; what it does; how it can help the foreman. (Similar "reviews" of other departments to be added from time to time.)

6. Explanation of the job evaluation and wage incentive program in effect at Revere.

Continuous Interpretation

To give continuity to the foreman's ability to interpret policies, it was promised that all foremen would receive immediate notification (wherever possible by written memoranda) of all changes in policies and interpretations. Particularly stressed were such matters as disposition of grievances (especially if the foreman is overruled); promotions and transfers of all management personnel; proposed changes in equipment, layout, or products; developments in union negotiations. *Everything points to the fact that that promise has been kept.*

Weekly Management Tours

All foremen had a problem in keeping up with what was going on. Written information helped somewhat, but face-to-face discussion seemed to be the ideal method. On the day shift, this was possible on a comparatively informal basis (to supplement the regular meetings). On the night shift, with fewer men and fewer representatives of top management present, it was not so simple.

The solution was found in having a representative of one of the functional departments (industrial relations, methods, and so forth) make a complete tour of all mills on each shift at least once a week. Thus an opportunity was provided for interchange of ideas, for discussion of specific problems, and for the often "isolated" night man to get immediate attention from the "front office."

Another step taken affected particularly the new foremen. Whenever a new man enters the management ranks, a schedule is worked out whereby he may spend at least one day in each of the following departments, to learn their functions and responsibilities, and thus get a better over-all picture of the company's operations: Sales, order, cost, payroll, production, industrial engineering, methods, mechanical engineering, and personnel. Arrangements were also made to permit veteran supervisors to undertake a similar indoctrination.

To fulfill the request for meetings to provide a flow of information, four types of meetings were organized, with regular schedules:

1. *All management supervisors with department head.* Monthly. Discuss current jobs, complaints, changes, and general mill activities. Minutes are kept and copies supplied all participants and the works manager. On request, discussions may be kept "off the record."

2. *Top foremen with department head.* Weekly or semi-monthly. Discuss primarily production problems. Department methods man, production man, and time study man present. Minutes forwarded to all management supervisors in department.

3. *All department heads (including functional departments).* Monthly. Discuss activities common to all departments, or problems which may have an interdepartmental effect. Review decisions by functional departments with which department head or his foremen were not in accord. The division industrial relations manager usually presides. Management supervisors may be invited to attend for specific discussions. Full minutes forwarded to works manager.

4. *Works manager with his management group.* Monthly. Discuss current problems, proposed changes in policies, equipment, construction. Provide top level interpretation where needed. Frequently invite top executives to explain and answer questions relating to their functions. At intervals, vice-president of division attends to give a picture of over-all company outlook.

What the Results Have Been

That just about sums up whatever formal activities are connected with Revere's foreman's "understanding" program. It may be noted that nothing has been mentioned about the factors that convinced top management that foremen should be accepted as a larger part of the management team.

Eikenberg puts it this way: "Initiating a program of this type was a logical function of the industrial relations department because of its facilities for research among the groups involved. We simply found out what the foremen thought line management should do. After proper discussion with line management, the principles of the program were established and put into practice. I can't tell you what it was the line executives noticed, but it was not long before they felt the results of better understanding. Consequently, their enthusiasm increased, and today it is the operating executives who are carrying the ball, not the industrial relations department. I think that, in large part, is just the type of recognition the men wanted."

Is that the whole picture? Not quite. Nothing has been said about promoting "human relations," the fifth point on the foremen's "platform." What was done about that?

A Foreman Sums It Up

Let one of the foremen speak on the subject: "When you know what the other fellow is doing, and *why* he is doing it, you begin to realize that he is a human being, too. And when you know the other fellow is a human being, I guess you just naturally treat him like one."

CEILING MOUNTED cooling units draw air in at bottom, pass it through cooling coils, and discharge at ceiling line. Individual control is provided by thermostats mounted on building columns

NEW DUCTLESS SYSTEM CUTS AIR

Cost per ton-hour has been cut by a highly flexible system which makes full use of available waste steam

BYRON A. ENGELBACH • PLANT ENGINEER, NEW ENGLAND CONFECTIONERY COMPANY, CAMBRIDGE, MASS.

RADICAL changes in the Necco air conditioning system will mean upward of 40 per cent savings in cost of operation per ton-hour. Separate control of temperature and humidity is a prime feature.

Studies had showed that substantial reductions in candy manufacturing costs could be made if the entire factory (not including the shipping floor) were air conditioned. To do so necessitated complete re-engineering of the existing system, which was of the conventional type.

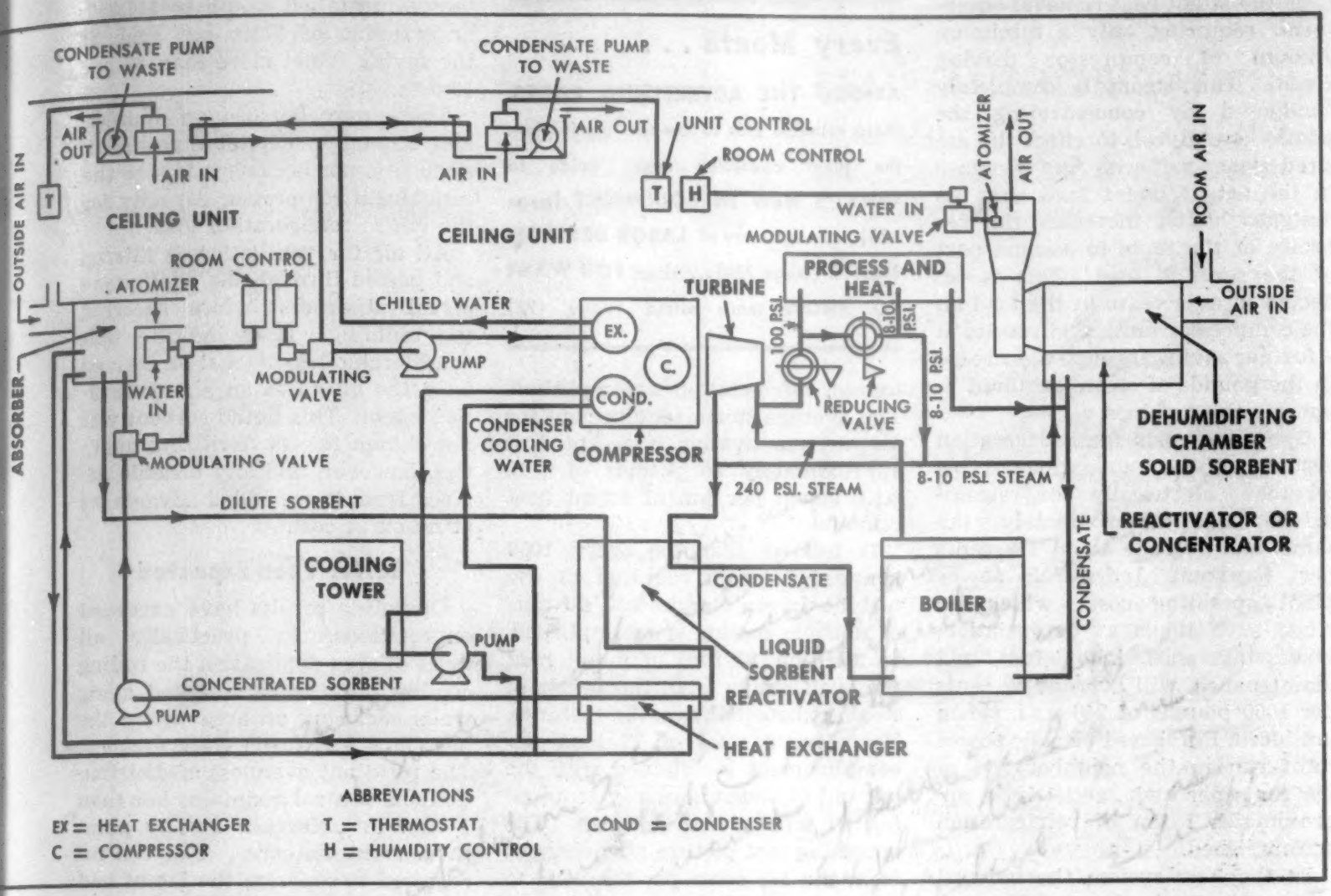
The following major objectives to be accomplished by the new air conditioning system were given to the engineering department:

1. Elimination of ducts.
2. Ease of alteration, to meet varying loads or area changes at minimum cost and trouble.
3. Introduction of filtered air in all production and comfort zones.
4. Elimination of drafts.
5. Use of separate temperature and relative humidity controls.
6. Economy of operation.
7. Use of waste steam.

It was decided to engage the services of an air conditioning consultant, to insure fulfillment of the objectives and the best possible integration of the old system and equipment with the new.

The original installation comprised centralized refrigerating compressors, both for chilled water and brine, driven either by motors or by straight condensing or non-condensing turbines operating on 240 p.s.i. steam. Located throughout the plant were the space conditioners, air washers, and distributing ducts.

Study showed that the air washers and the duct distribution system were overloaded, in most instances, and that they were not readily adaptable to the new loads and new areas to be conditioned. The brine an dchilled water compressors were operating at high cost because of inefficiency caused by overloading. Additional compressor capacity was needed. Facilities for supplying cooling water were overloaded, and any addi-



EXHAUST STEAM from compressor turbine (normally waste) is condensed in reactivating sorbent. Chilled water circulates from exchanger unit on compressor through series of loops and cooling units

CONDITIONING COSTS 40 PER CENT

tional compressor capacity would necessitate increasing these facilities. Also, there was considerable waste of steam by the compressor turbine drives.

To meet the objectives mentioned previously required a theoretical air conditioning load increase of over 100 per cent. Several solutions to the problem were presented, along with estimated costs for equipment, alterations, and operation. These solutions varied from the conventional type of system to the one that eventually was approved by management.

The system that was adopted is shown schematically above. It meets all the objectives. Installation costs compared favorably with those of the alternate proposals. Operational costs indicate large saving. A patent for this system has been applied for by the consultant who developed it.

It is made up of individual ceiling-mounted cooling units for removal of the sensible heat load. The coolant is chilled water supplied to an area from a master loop. The dehumidifiers are standard units using triethylene glycol as the sorbent. These units assume the latent heat load removal plus a portion of the sensible heat load. Exhaust steam from the compressor turbines is used as the reactivating or concentrating agent for the glycol, which is piped to the absorbers.

Cooling Towers Near Plant

Cooling towers were installed adjacent to the power plant to supply cooling water for the compressor condensers. This arrangement gave low pumping costs and minimum piping charges.

A 250-ton centrifugal compressor with non-condensing turbine was installed in the engine room. If some other type of system had been selected, it would have been necessary to install a compressor of 600-ton capacity.

Air conditioning the entire plant increased the original 330-ton load to some 900 tons. The new 250-ton compressor takes part of the additional load, while the remainder is carried by the triethylene glycol system.

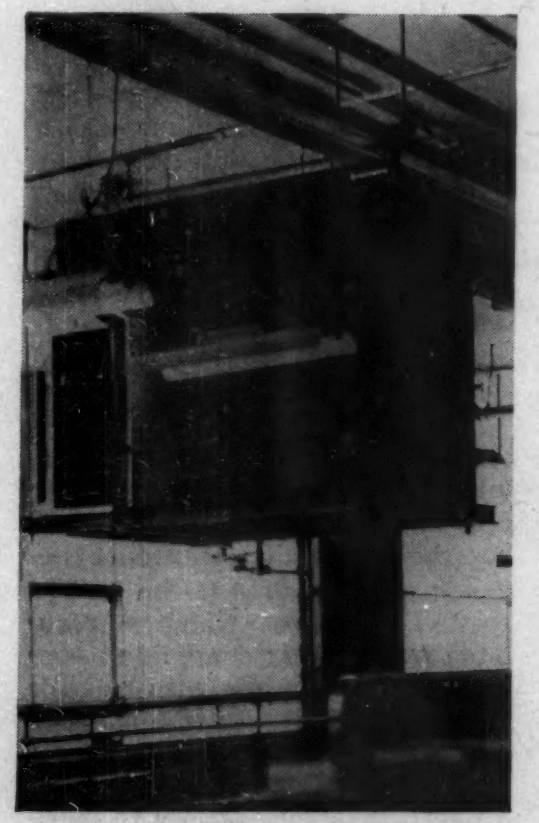
Assume that the latent load is 50 per cent of the designed peak latent load. Therefore, only 50 per cent of the designed capacity of the absorber is needed to reduce the moisture in the area to the desired relative humidity, which is regulated by a standard humidity control. Beyond the designed relative humidity stabilization, the addition of moisture to the air stream causes evaporative cooling to take place, converting latent capacity to sensible accomplishment of the absorber.

The sensible heat removal equipment automatically synchronizes

with the latent heat removal equipment, requiring only a minimum amount of compressor driving steam. This steam is completely condensed by concentrating the triethylene glycol, to effect the desired steam balance. Any decrease in the actual latent load over its designed value increases the capacity of the units to assume part of the sensible load. This is reflected in a decrease in the load on the compressor units, and results in a further saving through a decrease in the pounds of steam required to operate the turbines.

Operating costs for refrigeration systems of the conventional type, whether electrically or steam-driven, are approximately the same, and average about 1¼ cents per ton-hour. Industrial power plant operating costs, which include such items as depreciation, taxes, insurance, labor, fuel, and maintenance, will average 50 cents per 1000 pounds of 240 p.s.i. steam produced. Purchased electric power rates run in the neighborhood of 1¼ cents per kwh., and 1 kwh. approximates 1 ton of refrigeration accomplished.

In the new system the exhaust steam, maintained at 8-10 p.s.i. from turbine drives, is re-used, resulting in a further and nearly equal accomplishment on the sorbent side of the equipment. A non-condensing type of turbine uses 25 pounds of 240 p.s.i. steam for each ton of refrigeration accomplished. The average steam requirement for sorbent reactivation is accepted at approximately 30 pounds of 8-10 p.s.i. steam per ton of latent heat removal.



DEHUMIDIFICATION takes place in units which use triethylene glycol as the sorbent

Every Month . . .

AMONG THE ADVERTISING PAGES, those valuable aids to low-cost production: the plant operation man's guide to **WHAT'S NEW IN EQUIPMENT** (page 136) . . . a summary of **LABOR DEVELOPMENTS** (page 230) . . . things **YOU WANT TO KNOW** more about (page 192)

It follows that for every 1000 pounds of steam required at the turbine-driven compressor, 40 tons of sensible cooling is accomplished. In addition, 33 tons of latent heat removal results from the re-use of steam exhausted from the turbines. Therefore a total of 77 tons' accomplishment is obtained with the amount of steam normally required for 40 tons of refrigeration. The operating cost picture now changes from the 1¼ cents per ton-hour to 1.25 (40÷77) or 0.65 cents.

Additional condenser water pumping is required, so that, roughly, the expected saving approaches or exceeds 40 per cent with all items considered.

In terms of annual saving, the internal load is effective the year around. The conduction load, because of outside conditions, is added in the summer and discounted in the winter. The ratio of the internal load to the total load will vary with the type of industry and the individual installation. For use in a hypothetical illustration of yearly savings possible it can be assumed that the internal load is approximately 50 per cent of the total load.

Then the expected total ton-hour load on an annual basis for a 1000-ton application would be 50 per cent of 1000 times 250 working days times 8 hours' operation, or 1,000,000 ton-hours, plus the conduction load of 50 per cent of 1000 ton-hours times 125 working days times 8 hours' operation, or 500,000 ton-hours, making a total of 1,500,000 ton-hours.

The operating costs of a normal conventional-type system would be 1,500,000 times 1.25 cents per ton-hour, or $18,750. A comparative yearly operating cost for the system we installed would be $11,250, or a saving of $7500 per year, if the saving is not more than 40 per cent.

There may be also an appreciable saving in capital investment, since it is not necessary to size the centrifugal compressor capacity for the entire refrigeration load.

All air for ventilation is filtered and passed through the triethylene glycol absorbers before entering the building. Tests indicate that considerable benefit will be derived from the glycol as an air sterilization agent. This liquid sorbent was not chosen for its sterilizing qualities, however, and any benefits derived from it are added advantages at no extra cost.

Better Than Expected

Operating results have exceeded expectations. In practically all cases of area application the ceiling cooling units were mounted along walls enclosing an area where the heat flow and loads were greatest. The resultant evenness of distribution and control maintains less than 1 deg. F. difference at any point throughout the area. The control required to separate the latent and sensible heat loads, and balance the steam usage, results in precision control of the area.

Design of the ceiling-mounted cooling units eliminates stratification. The fan in the unit operates continuously at low speed, except when the area calls for cooling beyond the set operation range. Then the control device throws the motor into high speed. Air is taken in at the bottom of the unit, passed through cooling coils, and discharged through a 360-deg. opening at the ceiling line. The design of this opening is such that the cooled air is tempered and reduced in velocity before it reaches the occupants of the area. There are no cool or objectionable drafts.

Some areas require a minimum relative humidity, and it was necessary to install humidification equipment to meet the needs when outside conditions are less than the design conditions, irrespective of any cooling. Ordinary humidifiers were not satisfactory, so a special unit was built. This unit does not inject free water or water globules into the air. The water is pretreated and vaporized prior to freeing it. No induced air flow is necessary, and complete penetration is effected evenly throughout the entire area to be humidified.

DO NOT USE A TRUCK WITHOUT A

DISPATCH

TRUCK NO. 12 NO. 530

DRIVER Jake Miles DATE 5/27/48

ASSIGNED TO Semarest BY J.E.K.

CHECK LIST

TIME START 8:AM

USED

	IN	OUT
1. GAS	☑	☑
2. OIL PRESSURE	☑	☑
3. WATER	☑	☑
4. TIRES	☑	☑
5. HORN	☑	☑
6. STARTING	☑	☑
7. STEERING	☑	☑
8. GENERATOR	☑	☑
9. TILT AND ROTATION	☑	☑
10. HOIST	☑	☑

TIME FINISH 4 P.M.

DRIVER SIGN Jake Miles

REPAIRS NECESSARY replace bolts on guards replace clamps on revolving oil hose

REPAIR AUTHORIZATION SHEET NO. 146

TRUCK DISPATCH is filled in by driver before he takes truck and when he returns it. Need for repairs is okayed by foreman who also prepares and signs . . .

REPAIR AUTHORIZATION

TRUCK NO. 12 NO. 146

FOREMAN AUTHORIZING J. E. Kemmer

DATE 5/28/48 TIME 8 A.M.

CHECK LIST		REMARKS
1. OUT OF GAS	☐	Replace bolt on guard
2. IGNITION	☐	
3. STEERING	☐	
4. TIRES	☐	Replace clamps on revolving oil hose
5. STARTING	☐	
6.	☐	
7.	☐	

REPAIRED BY Joe Dutton MAN HRS. .5

REPAIRS MADE Bolt and clamp replaced

PARTS USED New 1 X 1½ bolt, washer, nut New 2-½ hose clamps

TIME START (DAY) 5/28/48 (HR.) 8:20 A.M.

TIME FINISH (DAY) 5/28/48 (HR.) 8:50 A.M.

REASONS FOR DELAY None TOTAL 5 hrs

REPAIR AUTHORIZATION. Upon completion of repairs, authorization is filled in by repairman and returned to foreman for filing as maintenance record

DISPATCH SYSTEM LOWERS TRUCK MAINTENANCE COSTS

E. A. BLYTHE • ASSISTANT SUPERINTENDENT, ALUMINUM DEPT., FEDERATED METALS DIV., AMERICAN SMELTING & REFINING CO., PERTH AMBOY, N. J.

DRIVERS, foremen, and maintenance department work hand in hand to keep Federated Metals' twelve power trucks in top operating condition. As a result, the number of major repairs has sharply decreased. And over-all truck maintenance costs have dropped with a profitable thud.

Two forms help make this possible. They are shown above. One is the dispatch form which constitutes the driver's "permission" to use the truck. The other is the repair authorization which instructs the maintenance department to make necessary repairs.

Drivers get their dispatches from the shift foreman. First thing a driver does before using a truck is inspect it. Need for repairs noted during this pre-operation inspection and during operation is entered on the dispatch form. Last thing he does at the end of his run is sign the dispatch.

Because a truck is inspected twice between any two operating periods, any variance in inspection reports can be localized to two drivers. The process also places added emphasis on the careful inspection and reporting of vehicle condition.

When information on a completed dispatch indicates repairs are needed, the foreman determines when they should be made and prepares an authorization.

The maintenance department repairs a truck only upon receipt of a properly executed authorization. When the repairs have been made, the authorization is returned to the foreman for his files. Study of these authorizations over a period of time provides information on maintenance costs per truck and for the fleet, downtime for repairs, and efficiency of driver inspections.

THE PAYOFF: EMPLOYEE-BOOKIE TURNS OVER DAY'S RECEIPTS TO NUMBERS RACKETEER WAITING IN GET-AWAY CAR AT PLANT GATE

EXTENSIVE IN-PLANT GAMBLING

FEW EMPLOYERS are aware that an illegal industry with an annual money "take" of over a billion dollars flourishes in their plants, mills, and factories. How much this industry-within-industry steals in production time for which wages are paid, is impossible to calculate.

A study conducted by McGraw-Hill's *Business Week* of in-plant gambling reveals:

1. On the average, one out of every 250 employees of industry is also employed by a gambling syndicate as an in-plant agent.

2. Illegal income of these in-plant agents varied in cases studied by *Business Week* from 50 to 1700 per cent of their legitimate wages.

3. For every in-plant gambling agent job, a dozen men apply from among those regularly employed in the plant.

4. Risk of being seriously punished if detected is relatively slight.

5. In plants of 1000 employees or more, an average of 10 per cent of production workers consistently gamble on the job; around 50 per cent of all employees in these plants gamble at some time.

6. In plants of less than 1000 employees, the extremes are found of either almost no one gambling or almost everybody.

7. It is nearly impossible for the lower echelons of plant supervision to be unaware of the gambling.

8. It is not unusual to find foremen or assistant foremen functioning as gambling agents or overlooking the activities of in-plant agents in return for a "cut."

9. Union shop stewards have been found acting as gambling agents, but in no case was the activity found to be sanctioned by the union.

10. There have been strikes to protest the disciplinary discharge of men discovered by management to be gambling agents.

11. In-plant gambling is a much more highly organized business since the end of the war; national syndicates are involved.

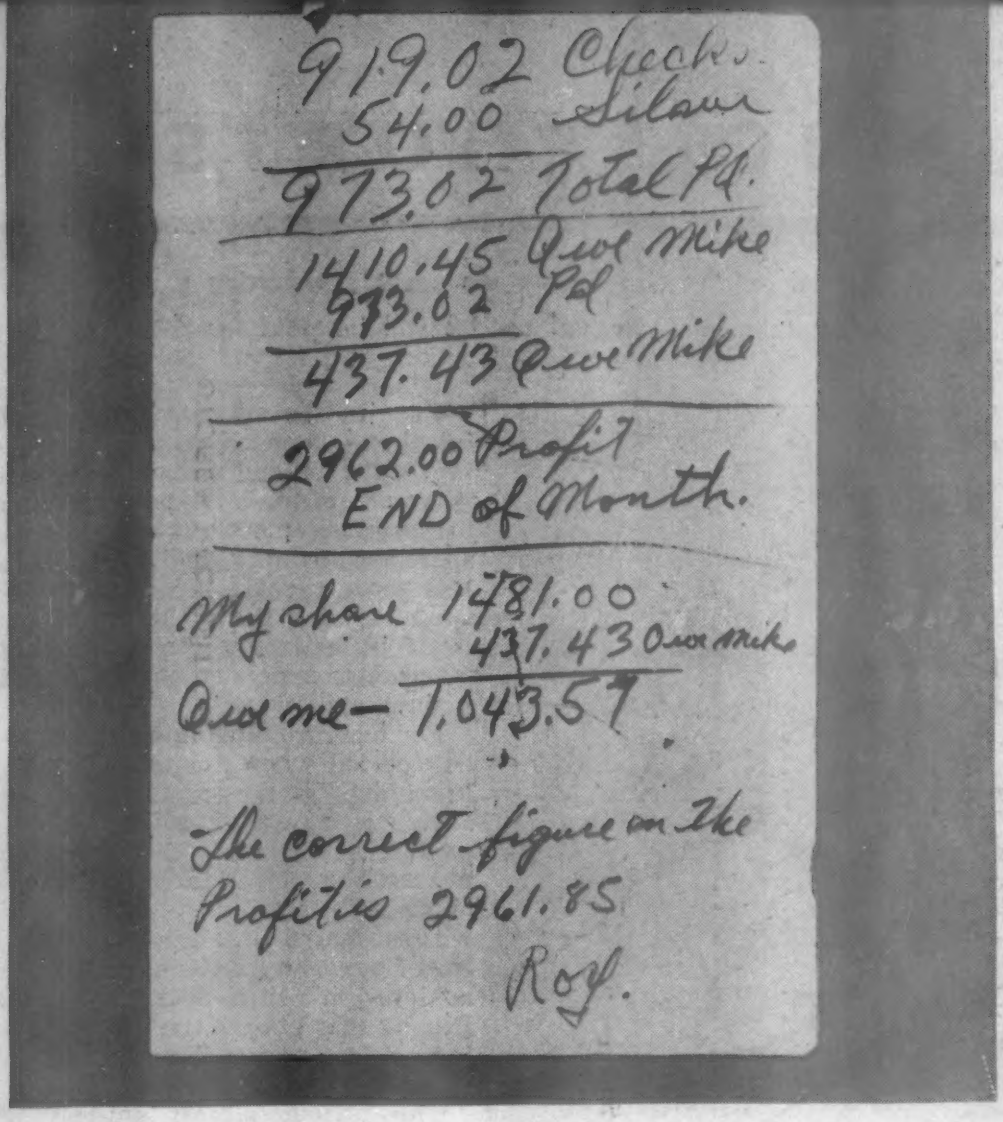
12. Principal forms of in-plant gambling are *numbers* (sometimes called policy betting) *handbook* (horserace betting) *football and baseball pools* (blind lottery betting on scores of team selections).

13. Few unions will protest company action against in-plant gambling; some are prepared to cooperate with employers in stamping it out.

14. Management can put an end to gambling on the job.

About $20 million of the $75 million a year spent for gambling in Detroit comes out of automobile plants. Of this, the dollar-wise proportion is around 50 per cent for handbooks; 30 per cent for numbers; 20 per cent for baseball pools. Most of the numbers bets range between 10 and 50 cents.

All bets are booked by regular "writers," almost all of whom are designated by syndicate operators outside the plant. These men do their writing inside the plant or just inside or outside the gates before the turn of a shift. For the most part, they have a regular place where they can be found at cer-



GAMBLING PAYS: HERE'S PROFIT TAB FOR ONE BOOKIE ON BACK OF STOCK REQUISITION

REVEALED BY SURVEY

tain hours and the bettors meet them there.

A large amount of the money bet is turned over to collectors during plant working hours. There are various messengers—truck drivers who come in and out of plants on regular schedules; collectors who wait below plant windows and catch parcels of cash thrown from an upper floor; part-time workers who leave earlier than the regular shift time; operators outside plant gates at the lunch hour.

Bets are taken during the day and payoffs made the next day. Bettors no longer get any receipt or record of their bets from the writer; this is now too dangerous.

While plant managements frown on gambling, they do not encourage the police to come in and make arrests on company property. Most plants summarily fire an employee arrested for gambling.

Except for cases already made public, individual companies cannot be identified. One of the most notable cases recently to come to light involved Ford Motor Company and a $5 million ring operating in the Rouge plant. Detroit law enforcement officials in a position to know said at least 250 numbers writers operated there, and that what goes on in Ford is typical of other plants in the area.

Similar rackets exist in at least six other cities:

CLEVELAND. Daily gambling goes on in practically every Cleveland plant with 200 or more employees. Principal gambling forms are numbers and football pools. Average number writers book $500 a week in bets. Half of Cleveland's numbers writers have regular stands in industrial plants.

AKRON. A $2-million-a-year numbers business flourishes in the city's three major rubber plants. Plant protection officers consider it an inevitable evil. Employees know—or can find out by asking the next worker—that bets can be made in plant washrooms or elevators.

BUFFALO. This area follows the Akron pattern except that football pool gambling is a much larger item. In one large plant alone, the annual football pool betting runs into seven figures. Of all the cities investigated, Buffalo alone still has large locker room crap games.

PITTSBURGH. Numbers is the biggest racket here. A bet can be placed anywhere—in a plant, a taxicab, a movie theatre, or at the corner newsstand. Estimated take in Pittsburgh and environs is more than $2 million weekly. Employers and the United Steelworkers are reported to make a practice of shutting their eyes to in-plant betting. The union maintains, however, that it will support management penalties against employees.

CHICAGO. Only a few scattered facts can be established. First, and most important, horserace betting appears to be more important and more prevalent than numbers. The explanation for this also explains why more information is hard to come by. The syndicate is so powerful, so entrenched, so efficient, that it can, to a large extent, keep cheap gambling forms out of the market. The best a man is usually able to do is to find a fellow-employee who will agree with him on a horse and split a $1 ticket.

SAN FRANCISCO. Probably because of its large Chinese population San Francisco is a lottery town; numbers and handbook operation are distinctly secondary. All in all, there is probably less in-plant gambling here than in any other major industrial city. Employers maintain it never was a major nuisance, in part because draw poker is legal in California and provides a legitimate opportunity to work off the gambling urge. However, in the waterfront trades—a large slice of the city's employment—crap shooting goes on all the time.

★ ★ ★

In the main, four different management approaches to in-plant gambling were encountered:

1. Refusal to acknowledge that gambling goes on, even when directly confronted with evidence of its existence.

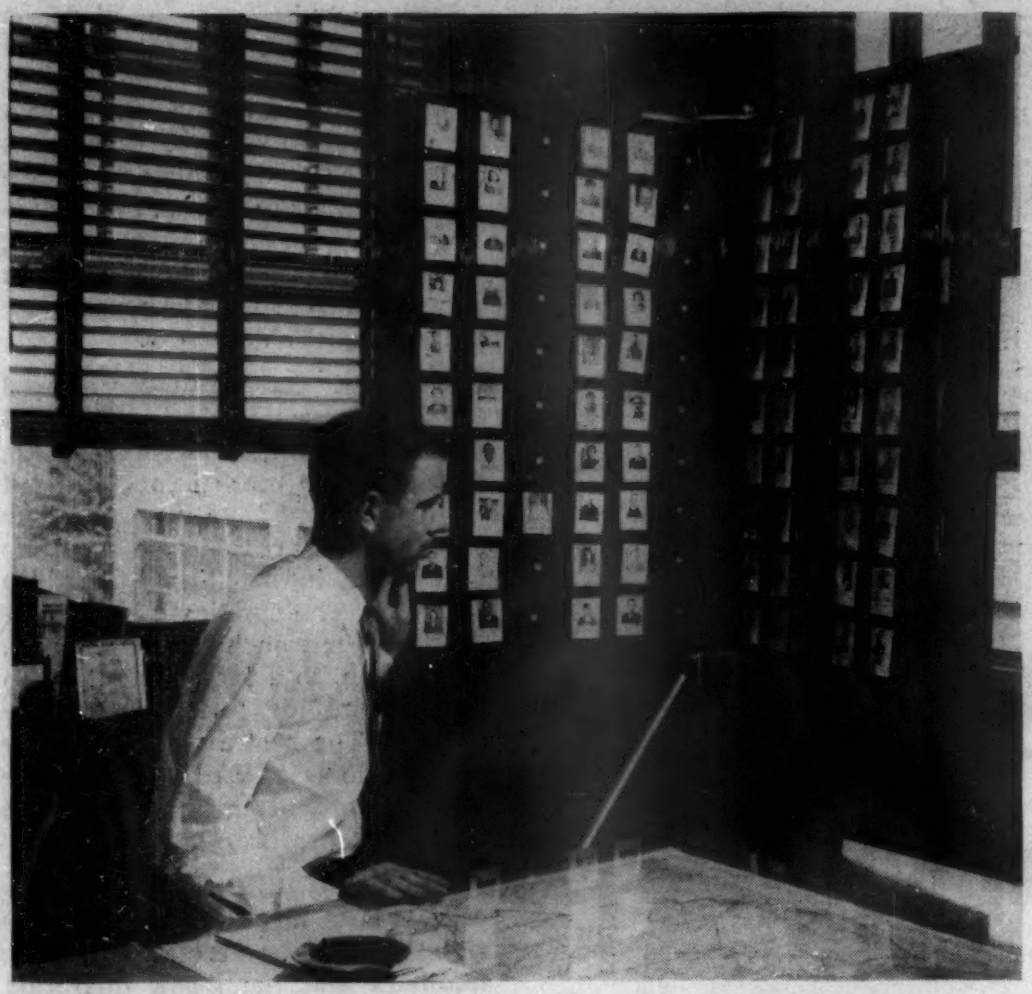
2. Recognition of widespread in-plant gambling, but an unwillingness to do anything about it.

3. Attempts to confine in-plant gambling to the locker rooms during lunch and rest periods.

4. Sustained offensives to stamp out gambling.

OPERATING SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary operating accomplishment. Accepted articles will be paid for



TO HELP HIM carry out that valuable "personal touch" in the shop, the president of Leslie Company, Lyndhurst, N. J., has a photographic index close by his office desk. The index shows in alphabetical order each employee's photograph, with his name and department

Mobile Toolroom Saves Time and Money

Savings in both time and money are being achieved by Humble Oil & Refining Company since the purchase of a mobile tool house last September, for use in its refinery at Baytown, Tex.

This piece of equipment is a specially built trailer. It is fitted with a public address system and telephone connection which facilitate calls for and delivery of tools when one of the large refining units has been taken out of service for inspection, cleaning, and repairs. In less than a year, the $100,000 investment has more than paid for itself by reducing the number of man-hours expended in repair and maintenance work.

For instance, during a certain 16-day period when a catalytic cracking unit was being inspected, the saving attributed to the trailer was particularly large, because the nearest regular tool house was about 2100 feet from the unit. It was estimated that an over-all saving of between $2000 and $3000 was achieved in a little over two weeks. During that period, the vehicle was in use 24 hours a day, and issued about 4600 tools.

The trailer, almost entirely of steel construction, is about 38 feet long, 8 feet wide, 9 feet high. Tools are stored in 572 rectangular steel bins arranged against the walls.

When tools are required they may be obtained by telephoning the toolroom operator. He lists the tools required, makes out a "toolroom loan order," and announces over the public address system that the list is ready to be picked up.

•

Gravity Feed Dispensers for Touch-Up Paint

At the end of the final car assembly line at the assembly plant of Chevrolet Motor Car Division, Flint, Mich., an operator is supplied with gravity feed dispensers for touch-

up paint. These dispensers, hung on a special bench rack, contain paint to match each car color. They are equipped with a rubber hose, tipped by a metal nozzle with a trigger valve.

The tip of the metal nozzle is cut in a V shape, and the entire assembly is mounted on a stick long enough to allow the paint enough "head" to flow. As each car approaches, the operator selects the container holding the matching color. Then, as the car moves slowly along, he runs the V nozzle along the edge of the hood, the rain guard rails, and other wear areas, thus repairing any spots along these edges that may have been scratched during the assembly operation.

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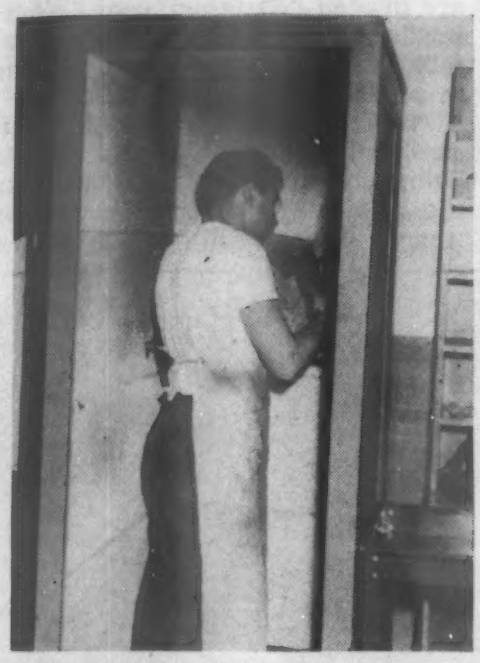


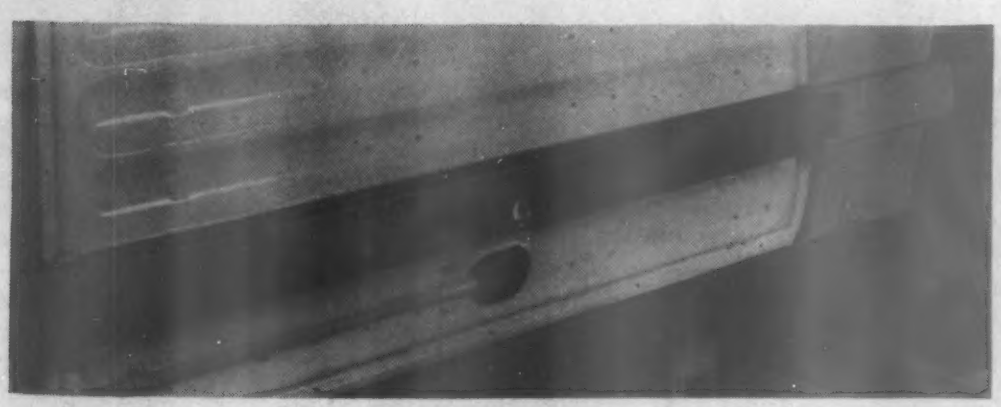
TELEPHONE BOOTHS lined with noise-absorbent panels help make telephone conversations easier in noisy shop areas at Micro Switch Division, First National Corporation, Freeport, Ill. Two types of booths are used—the full-length stand-up type and the small bench type, with just enough room for the head, depending on the space available

"Hash Marks" Tell Machine's Age

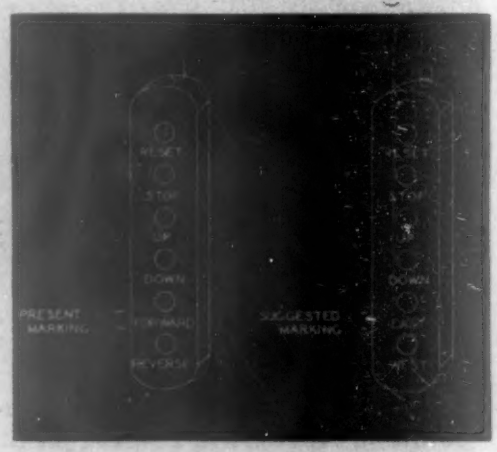
"Hash marks" are placed in conspicuous locations on all machines and equipment at the Ingersoll Milling Machine Company, Rockford, Ill. Workers take pride in maintaining their equipment and in seeing the marks accumulate. Typical remarks heard around the plant are: "She's just a youngster," or, "Boy, is he a veteran." The machine shown in the photograph above looks like a youngster, but it really is twelve years old.

Hash marks help management, too. They give everyone a quick picture of the age of machine tools without looking through a lot of paperwork and reports.

Note also that the air hose used on this machine is retractable (arrow). Hose is kept out of the operator's way while he's working on or around the machine. But it is easily obtained when needed to clean chips or other dirt from machine or parts. Also hose is protected from oil and bruises when not in use.



SAVINGS amounting to 97 feet of 1½-in. masking tape and 2½ hours, on each bus, are being realized at the truck and coach division, General Motors Corporation, Pontiac, Mich. A special metal masking shield was devised to eliminate the necessity for using masking tape to cover the chrome strips on the Greyhound bus baggage compartment when the bus is spray painted. The metal shield is easily clamped into place, and as easily removed when the paint job is completed



Better Directions for Crane Operators

Directing a traveling crane from the floor by a cable-suspended

switchbox often brings up the question, "Which way is forward?" In the die department of Allis-Chalmers, Milwaukee, this confusion has been eliminated by changing the switchbox buttons that used to read "forward" and "reverse" to "east" and "west." This arrangement further allows any man requiring the crane for short periods to operate it without confusion.

•

FOR THE CONTROL OF QUALITY, an intercommunication and loudspeaker system is used on the continuous pickle line at the Aliquippa, Pa., Works of Jones & Laughlin Steel Corporation. Here, operator at delivery end is talking to operator at entry end, more than 250 yards away

•

Scoreboard Helps in Meeting Output Quota

Sewing operators at Charis Corporation, Allentown, Pa., are on incentive. In addition, each sewing department has a non-monetary incentive to speed production.

A production control department sets up a weekly production quota for individaul sewing departments to meet. Quotas (in terms of dozens of garments completed) are posted on special bulletin boards set up within the departments. On each board appears the department's name, its quota, and a month's schedule by weeks, showing dozens of garments required, dozens produced, and dozens in process. These figures are prepared on small pieces of cardboard and are easily attached to the boards.

When checkboys move finished bundles of garments out of the department, they tabulate on a progress chart, on the lower portion of the scoreboard, the number of bundles completed. These figures are entered by style number. Daily and weekly totals of all styles are entered on the chart to show operators how close they have come to attaining the production goal set up for the various styles.

Assignment Board for Maintenance Control

DEL ZEIGLER, Plant Engineer, Woodward Governor Company, Rockford, Ill.

A job assignment board, located in the maintenance department at Woodward Governor, gives a quick view of the jobs on hand and the men assigned to them.

Cards are placed under spring clips on the board the moment a job is assigned to any particular maintenance man. Rows of clips are headed "Assigned" and "Working." Thus everyone can see what jobs are waiting and what work is in process.

The board has eliminated confusion and the possibility of records being buried or lost; and workers can be quickly located if an emergency call comes in.

ULTRA-VIOLET LAMPS above the doors that lead from the factory to the plant hospital at Snap-On Tools Corporation, Kenosha, Wis., are helping prevent the spread of infection. Resident nurses give credit to the lamps for the reduction in colds and other contagious illnesses. Several of the nurses have spent more than three years treating colds and spraying sore throats without infection to themselves since installation of the lamps

LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

Despite what they tell you, the labor politicians don't care too much whether it's Truman or Dewey on November 2. What really excites them is Congress.

It's in the congressional fights that organized labor hopes to prove a potent poll puncher. Truman can't be saved and Congress can't be changed overnight. The labor boys know this. So they're trying the next best thing: *Elect some friends, defeat some enemies.*

Here's the plan: Don't waste big money or effort where it won't do any good. Pour it on heavy where it will.

This means little, if anything, will be done against sure winners like Allen, Taber, Hoffman, and Keefe in the House. Or, in the Senate, against Saltonstall, Bridges, Wherry, Dworshak, Wilson, Mundt. All are Republicans.

Heaviest labor blows will be struck in five Senate races where AFL and CIO back Democrats to unseat pro-Taft-Hartley Republicans. Tagged for defeat: Brooks in Illinois, Robertson in Wyoming, Revercomb in West Virginia, Ball in Minnesota, Buck in Delaware.

In House races, labor's fighting will be centered in so-called "marginal" districts. The AFL lists 125 once New Deal districts that went Republican last time. CIO will make a showdown fight in only 70 districts.

By picking its spots, labor can make its vote effective. Primary scalps already hang in Tennessee, Iowa, and North Carolina. Setbacks have come, too, notably in Kentucky.

But even the Kentucky primary had its bright spot from labor's viewpoint. All labor joined to nominate James S. Golden in the Harlan County district. He's attorney for John L. Lewis's mine workers and a Republican. He's "in." No Democrat filed.

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Taft-Hartley's first year hasn't hurt unions willing to use the law. That's why it's fading as the big election issue. CIO now rates a congressman's stand on prices and housing as high as his T-H vote.

Labor's campaign chests will not overflow with money. Under T-H, union funds can't be spent. So dollar donations are asked of union members. All told, they won't add up to $5 million, despite 15 million membership.

Two major splits will deaden labor's punch. One is in CIO. Left-wing unions, with 1,500,000 members, are lined up behind Wallace and Progressive Party aspirants for Congress. They're not kicking in to CIO-PAC. But more important, they'll help defeat some PAC-backed candidates.

The other split is in AFL. The two largest unions—Hutcheson's carpenters and Tobin's teamsters—won't play ball with AFL's Labor League for Political Education. They're running their own show.

•

Here's how we dope the election:

—Dewey will walk in. The House will stay heavily Republican. Democrats have a bare chance to win the Senate, but they won't.

—Labor's political punch will be potent in spots. It will knock out some T-H supporters. But labor won't get a Congress in any mood to repeal T-H.

In politics, the labor leaders also have their eyes on state capitals. They want anti-labor laws killed in the states as one step toward T-H repeal. They can point to Louisiana as one way to do the job.

Last February, the AFL helped elect Governor Long and 113 members of the Louisiana legislature. By June, the state had repealed its 1946 law controlling union activity. It also passed a new one against importing strikebreakers.

North Dakota citizens refused to retreat. In a June referendum, they approved two laws passed last year against the closed shop and regulating strikes.

Anti-Communist pressure gains momentum in the unions. Curran's maritime union cleaned out all left-wing officers. CIO chemical and glass workers now bar Commies from office. AFL's teamsters won't give them cards. In New York AFL convention, they can't be delegates.

It's not clear yet what the employer can do with Communists on his payroll. Firing "poor security risks" didn't work at Westinghouse. The Navy asks only that they be kept away from "restricted areas" and "classified matters."

NLRB says employers may refuse to hire Communists. It also approves discharges for mass picketing, a Commie tactic. But it hasn't spoken clearly yet on firing Communists.

•

Taft-Hartley Bite: Complaint to NLRB got cement workers union to refund featherbedding wages.

Political Assignment: Maurice Tobin, new secretary of labor, will spend the next two months telling the voters how Congress gutted the Labor Department.

New Look: That's what AFL hopes to get from Owen & Chappell, New York publicists. Cost: $500,000.

LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

MUST deflation end in depression?

Or is it possible that the upward price spiral is about over and that it will be followed by an extended period of stable prosperity?

Answers to these questions are not easy to find. And there are major risks in putting together an answer. The business outlook, for example, may turn around overnight on the swing of international politics.

But here are the outlines of the forces that will shape the final answer:

1. This boom is different from any previous one. True, the history cycles show that prosperity always ends. But this period of prosperity may be different enough to last for several years more. For one thing, this time prosperity is much more widely shared than it was in, say, the 1920's. Then farmers had a thin time of it, industrial wage rates lagged behind the parade, common stockholders were in the big money. *Today, in contrast, farmers are fabulously well-off; the average industrial worker can buy a third more than in pre-war days with his take-home pay; and the stock price index is the only price index that no one thinks is inflated.*

2. Another factor that must be considered is the tremendous backlog of savings held by U. S. families. About 35 million families, out of 48.4 million in the country, have bank accounts or securities. And half of these families have more than $820 in such liquid savings. Without counting such things as cash, insurance, or real estate, these items alone give a good share of families a cushion to fall back on in emergencies or to use in buying such things as houses, automobiles, and refrigerators.

3. Industry is reaching new horizons in its drive to purchase new buildings and equipment. These purchases are currently at a rate of almost $20 billion a year rate, about two and one-half times the record pre-war rate of 1941. Many business analysts argue that this rate can't last. Once war-created backlogs have been worked off, capital investment will slide, they say. But, with wage rates doubling in the last nine years, labor-saving machinery is a better bet than ever. And a number of important industries are on the brink of technological revolutions. Chemical and food processing companies, for example, are switching from batch to continuous-flow processing methods. Steel is beginning to use oxygen by the ton to speed iron and steel making. Synthetic oils are just beginning to be made on a commercial scale. *That means that the chances of stabilizing business investment are increasingly bright. Certainly its underlying strength should prevent any such collapse in capital goods as we had in the early 1930's.*

4. The influence of the U. S. government on the economy now is of major importance. Today the government collects in taxes, and spends, almost a fifth of the national income. It directs military and diplomatic affairs in a wild world. It regulates key parts of the economic machine, such as credit and currency. Moreover, understanding of the way our economy works has multiplied in the last 20 years. *It is a fair bet now that the administration coming into office in 1949 will do nothing to upset prosperity.*

•

With these substantial props under prosperity, why should there be any concern about a business slump?

The reason for concern, many observers say, is chiefly that prices have got so badly out of line that a readjustment is necessary. In the over-all economy, as compared to pre-war, farm and food prices are still far out of line on the high side, rents and electricity on the low side. And within almost any one field there are distortions. In building, for example, lumber has tripled in price since 1939, but gypsum board is up only 30 per cent.

Already at work, however, are forces that promise to iron out some of these distortions. A farm crop 6 per cent larger over-all than last year's, for example, may lower food prices in 1949.

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If that should come true, it would be possible to meet fourth-round wage increases and still hold industrial prices stable, perhaps even to reduce some of them.

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In short, the fact that this boom is so different from past booms and the chances of new increases in productivity make it *possible* that the U. S. may pull out of inflation and settle down to a long period of good business.

LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

Despite what they tell you, the labor politicians don't care too much whether it's Truman or Dewey on November 2. What really excites them is Congress.

It's in the congressional fights that organized labor hopes to prove a potent poll puncher. Truman can't be saved and Congress can't be changed overnight. The labor boys know this. So they're trying the next best thing: *Elect some friends, defeat some enemies.*

Here's the plan: Don't waste big money or effort where it won't do any good. Pour it on heavy where it will.

This means little, if anything, will be done against sure winners like Allen, Taber, Hoffman, and Keefe in the House. Or, in the Senate, against Saltonstall, Bridges, Wherry, Dworshak, Wilson, Mundt. All are Republicans.

Heaviest labor blows will be struck in five Senate races where AFL and CIO back Democrats to unseat pro-Taft-Hartley Republicans. Tagged for defeat: Brooks in Illinois, Robertson in Wyoming, Revercomb in West Virginia, Ball in Minnesota, Buck in Delaware.

In House races, labor's fighting will be centered in so-called "marginal" districts. The AFL lists 125 once New Deal districts that went Republican last time. CIO will make a showdown fight in only 70 districts.

By picking its spots, labor can make its vote effective. Primary scalps already hang in Tennessee, Iowa, and North Carolina. Setbacks have come, too, notably in Kentucky.

But even the Kentucky primary had its bright spot from labor's viewpoint. All labor joined to nominate James S. Golden in the Harlan County district. He's attorney for John L. Lewis's mine workers and a Republican. He's "in." No Democrat filed.

•

Taft-Hartley's first year hasn't hurt unions willing to use the law. That's why it's fading as the big election issue. CIO now rates a congressman's stand on prices and housing as high as his T-H vote.

Labor's campaign chests will not overflow with money. Under T-H, union funds can't be spent. So dollar donations are asked of union members. All told, they won't add up to $5 million, despite 15 million membership.

Two major splits will deaden labor's punch. One is in CIO. Left-wing unions, with 1,500,000 members, are lined up behind Wallace and Progressive Party aspirants for Congress. They're not kicking in to CIO-PAC. But more important, they'll help defeat some PAC-backed candidates.

The other split is in AFL. The two largest unions—Hutcheson's carpenters and Tobin's teamsters—won't play ball with AFL's Labor League for Political Education. They're running their own show.

•

Here's how we dope the election:

—Dewey will walk in. The House will stay heavily Republican. Democrats have a bare chance to win the Senate, but they won't.

—Labor's political punch will be potent in spots. It will knock out some T-H supporters. But labor won't get a Congress in any mood to repeal T-H.

In politics, the labor leaders also have their eyes on state capitals. They want anti-labor laws killed in the states as one step toward T-H repeal. They can point to Louisiana as one way to do the job.

Last February, the AFL helped elect Governor Long and 113 members of the Louisiana legislature. By June, the state had repealed its 1946 law controlling union activity. It also passed a new one against importing strikebreakers.

North Dakota citizens refused to retreat. In a June referendum, they approved two laws passed last year against the closed shop and regulating strikes.

Anti-Communist pressure gains momentum in the unions. Curran's maritime union cleaned out all left-wing officers. CIO chemical and glass workers now bar Commies from office. AFL's teamsters won't give them cards. In New York AFL convention, they can't be delegates.

It's not clear yet what the employer can do with Communists on his payroll. Firing "poor security risks" didn't work at Westinghouse. The Navy asks only that they be kept away from "restricted areas" and "classified matters."

NLRB says employers may refuse to hire Communists. It also approves discharges for mass picketing, a Commie tactic. But it hasn't spoken clearly yet on firing Communists.

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Taft-Hartley Bite: Complaint to NLRB got cement workers union to refund featherbedding wages.

Political Assignment: Maurice Tobin, new secretary of labor, will spend the next two months telling the voters how Congress gutted the Labor Department.

New Look: That's what AFL hopes to get from Owen & Chappell, New York publicists. Cost: $500,000.

LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

MUST deflation end in depression?

Or is it possible that the upward price spiral is about over and that it will be followed by an extended period of stable prosperity?

Answers to these questions are not easy to find. And there are major risks in putting together an answer. The business outlook, for example, may turn around overnight on the swing of international politics.

But here are the outlines of the forces that will shape the final answer:

1. This boom is different from any previous one. True, the history cycles show that prosperity always ends. But this period of prosperity may be different enough to last for several years more. For one thing, this time prosperity is much more widely shared than it was in, say, the 1920's. Then farmers had a thin time of it, industrial wage rates lagged behind the parade, common stockholders were in the big money. *Today, in contrast, farmers are fabulously well-off; the average industrial worker can buy a third more than in pre-war days with his take-home pay; and the stock price index is the only price index that no one thinks is inflated.*

2. Another factor that must be considered is the tremendous backlog of savings held by U. S. families. About 35 million families, out of 48.4 million in the country, have bank accounts or securities. And half of these families have more than $820 in such liquid savings. Without counting such things as cash, insurance, or real estate, these items alone give a good share of families a cushion to fall back on in emergencies or to use in buying such things as houses, automobiles, and refrigerators.

3. Industry is reaching new horizons in its drive to purchase new buildings and equipment. These purchases are currently at a rate of almost $20 billion a year rate, about two and one-half times the record pre-war rate of 1941. Many business analysts argue that this rate can't last. Once war-created backlogs have been worked off, capital investment will slide, they say. But, with wage rates doubling in the last nine years, labor-saving machinery is a better bet than ever. And a number of important industries are on the brink of technological revolutions. Chemical and food processing companies, for example, are switching from batch to continuous-flow processing methods. Steel is beginning to use oxygen by the ton to speed iron and steel making. Synthetic oils are just beginning to be made on a commercial scale. *That means that the chances of stabilizing business investment are increasingly bright. Certainly its underlying strength should prevent any such collapse in capital goods as we had in the early 1930's.*

4. The influence of the U. S. government on the economy now is of major importance. Today the government collects in taxes, and spends, almost a fifth of the national income. It directs military and diplomatic affairs in a wild world. It regulates key parts of the economic machine, such as credit and currency. Moreover, understanding of the way our economy works has multiplied in the last 20 years. *It is a fair bet now that the administration coming into office in 1949 will do nothing to upset prosperity.*

•

With these substantial props under prosperity, why should there be any concern about a business slump?

The reason for concern, many observers say, is chiefly that prices have got so badly out of line that a readjustment is necessary. In the over-all economy, as compared to pre-war, farm and food prices are still far out of line on the high side, rents and electricity on the low side. And within almost any one field there are distortions. In building, for example, lumber has tripled in price since 1939, but gypsum board is up only 30 per cent.

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LEWIS-SHEPARD FORK TRUCK

LEWIS-SHEPARD POWER JACKLIFT

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Speed up materials handling . . . cut costs

Every day, more and more companies are discovering the faster, safer and more economical way to handle materials. They are giving the job of lifting, hauling and stacking to the efficient battery electric truck. Time is being saved . . . more tons moved per man per hour. Handling costs have been cut as much as 50%. And more storage space is being utilized by high tiering.

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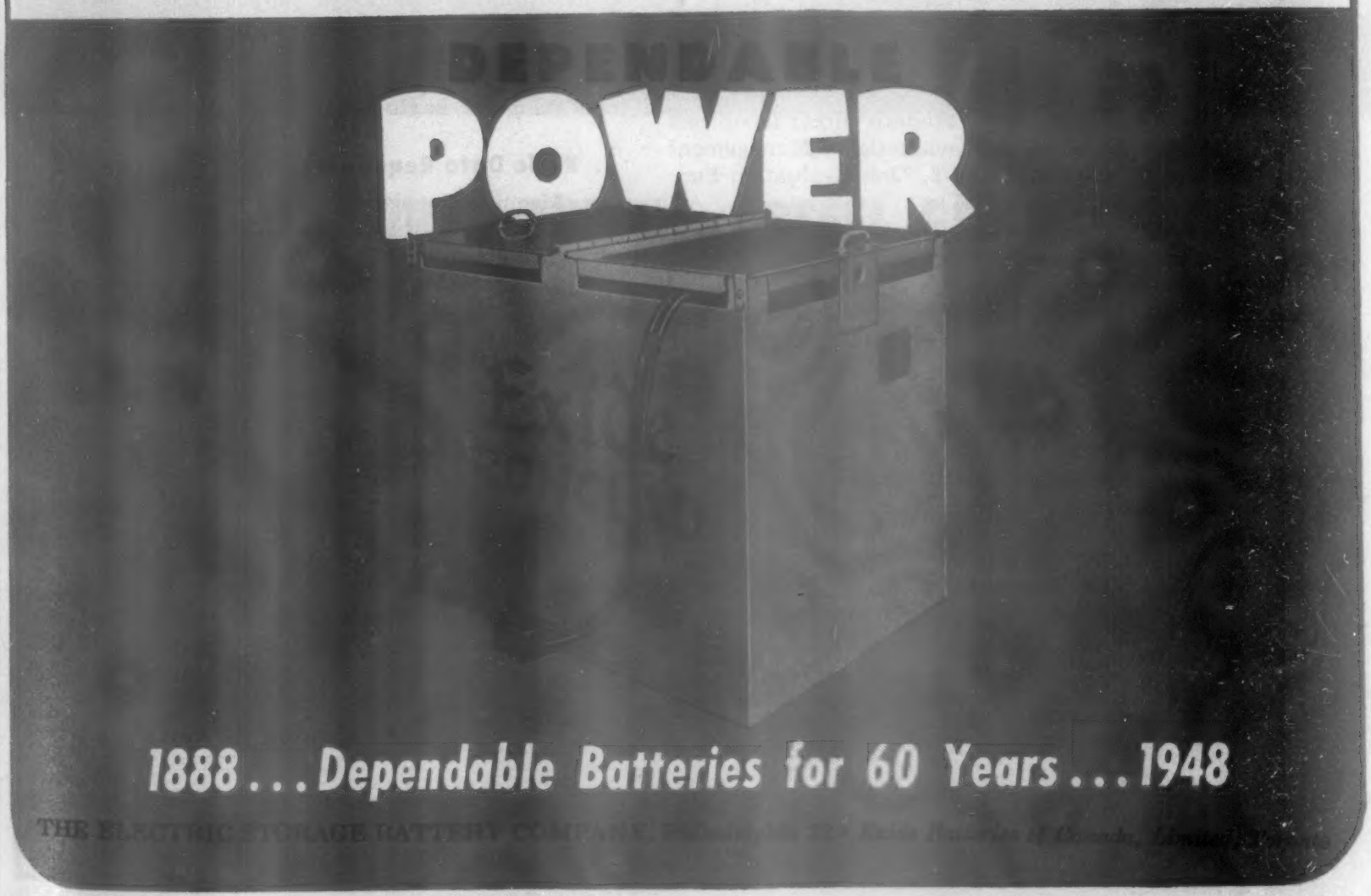
Write for further particulars and FREE copy of Exide-Ironclad Topics which covers latest developments in material handling and shows actual case histories.



management data sheet 34

COST CONTROL FUNDAMENTALS

1. Purpose of Cost Control

a. Cost control represents a tool of management which is used to analyze variations in operating costs, and to improve operating profits through the reduction or elimination of unfavorable variations.

2. Fields of Application

a. Cost control may be applied to any type of manufacturing enterprise.

b. Generally, it is most effective where steps have been taken to install standard costs (Management Data Sheets Nos. 11 and 12, "Standard Costs Fundamentals," July, 1947).

3. Principles of Cost Control

a. Establish standard manufacturing methods for all operations.

b. Develop direct labor standard time values for all operations on the basis of time study (Management Data Sheets Nos. 3 and 4, "Time Study Fundamentals," February, 1947).

c. Convert standard time values for all direct labor operations into standard direct labor cost on the basis of job evaluation (Management Data Sheets Nos. 7 and 8, "Job Evaluation Fundamentals," April, 1947).

d. Determine departmental and plant capacity in terms of standard direct labor man-hours and machine hours.

e. Establish departmental and plant budgets for direct labor and indirect manufacturing expense on the basis of departmental and plant capacity.

f. Establish procedures for accurate reporting of departmental production and costs, and for the proper analysis of these reports.

g. Determine the efficiency of manufacturing equipment and direct labor on the basis of comparisons of actual machine hours and direct labor hours with standard machine hours and direct labor hours contained in physical goods produced which pass inspection.

h. Determine the variations in hourly rates of direct labor and manufacturing equipment on the basis of comparisons of actual hourly rates with standard hourly rates.

i. Evaluate departmental profit or loss resulting from production activity above or below departmental capacity.

j. Inform the manufacturing supervisory force constantly of the proper interpretation of cost control analyses, so that corrective action may be taken.

k. For maximum effectiveness, steps should be taken to utilize cost control as the basis of a supervisory wage incentive plan (Management Data Sheets Nos. 5 and 6, "Wage Incentive Fundamentals," March, 1947).

4. Typical Cost Control Analysis

a. To illustrate these principles, a typical cost control analysis is outlined in the following sections.

b. The example itemizes the basic data required, the significant cost control ratios developed, and the evaluation of variations in operating costs, classified according to major causes of the variations. It is intended to represent the operation of a single manufacturing department.

5. Basic Data Requirements

a. Machine capacity per week, based upon existing manufacturing equipment, is 1000 machine hours.

b. Direct labor capacity per week, in terms of manpower required to man the equipment, is 1500 man-hours.

c. Direct labor budget per week, representing the evaluation of the man-hours at a standard rate of $0.80 per hour, is $1200.

d. Indirect manufacturing expense budget per week, including all other expenses controllable by manufacturing supervision, and which may be considered as an evaluation of the machine hours at a standard rate of $1.80 per hour, is $1800.

e. There are 800 actual machine hours in a typical week.

f. There are 1200 actual direct labor hours.

g. The actual direct labor payroll is $1440.

(CONTINUED ON PAGE 134)

Prepared by Bruno A. Moski, Jr., Plant Manager, The American Paper Goods Company, Kensington, Conn.

BEARING FAILURES DOWN... STEEL PRODUCTION UP

Sun Grease Increases Production by Cutting Bearing Failures 92%

Burned-out table roll bearings were causing loss of valuable production-time in a steel mill. The failures—as many as five a week—were due to the grease melting and running out as a result of heat reflected from the steel plates. Each bearing-replacement cost $80, not counting labor cost.

A Sun Engineer who was called in recommended a high-melting-point grease that had proved its ability under similar conditions.

With this Sun lubricant on the job, 92 percent of the bearing failures have been eliminated. A cash saving of about $18,000 a year has resulted, and additional economies have been realized from greater production, power savings, and lower grease costs.

Sun "Job Proved" lubricants are helping to increase production, and to cut maintenance costs, in every kind of industry. What they do for others, they can do for you. For full information, call or write your nearest Sun Office.

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SUN PETROLEUM PRODUCTS

"JOB PROVED" IN EVERY INDUSTRY

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management data 35 sheet

COST CONTROL FUNDAMENTALS

(CONTINUED FROM PAGE 132)

h. The actual indirect manufacturing expense is $1200.

i. Actual departmental production, evaluated at standard cost, represents 900 standard man-hours at $0.80 per hour, or $720 direct labor cost.

j. Actual departmental production, evaluated at standard cost, represents 750 standard machine hours at $1.80 per hour, or $1350 indirect manufacturing expense.

6. Cost Control Ratios

a. Ratio of actual machine hours to machine capacity, or 800 to 1000, is 80 per cent.

b. Ratio of actual machine hours to standard machine hours produced, or 800 to 750, is 107 per cent.

c. Ratio of actual direct labor hours to direct labor capacity, or 1200 to 1500, is 80 per cent.

d. Ratio of actual direct labor hours to standard man-hours produced, or 1200 to 900, is 133 per cent.

e. Ratio of actual direct labor payroll to standard direct labor budget, or $1440 to $1200 is 120 per cent.

f. Ratio of direct labor payroll to standard direct labor cost produced, or $1440 to $720, is 200 per cent.

g. Ratio of actual indirect manufacturing expense to indirect manufacturing expense budget, or $1200 to $1800, is 67 per cent.

h. Ratio of actual indirect manufacturing expense to standard indirect manufacturing expense produced, or $1200 to $1350, is 89 per cent.

i. Ratio of standard direct labor produced to direct labor budget, or $720 to $1200, is 60 per cent.

j. Ratio of standard indirect manufacturing expense produced to indirect manufacturing expense budget, or $1350 to $1800, is 75 per cent.

k. Index of machine efficiency—standard machines hours produced to actual machine hours—or 750 to 800, is 93 per cent.

l. Index of indirect manufacturing expense level—actual indirect manufacturing expense to standard indirect manufacturing expense produced—or $1200 to $1350, is 89 per cent.

m. Index of direct labor efficiency-standard man-hours produced to actual direct labor hours —or 900 to 1200, is 75 per cent.

n. Index of direct labor pay level—actual direct labor cost per hour to standard direct labor cost per hour—or ($1440 ÷ 1200 = $1.20 per hour) to $0.80 per hour, is 150 per cent.

7. Cost Control Variations

a. The variations in operating costs, classified according to major causes of the variations, may be evaluated and presented as a weekly departmental profit-and-loss statement, with respect to direct labor and indirect manufacturing expense, as follows . . .

Account	Profit	Loss
1. *Machine efficiency,* or actual hours (800), less standard machine hours produced (750), equals a loss of 50 machine hours at $1.80 per hour		$90
2. *Direct labor efficiency,* or actual direct labor hours (1200), less standard man-hours produced (900), equals a loss of 300 man-hours at $0.80 per hour		240
3. *Direct labor pay level,* or actual direct labor cost per hour ($1.20), less standard direct labor cost per hour ($0.80), equals a loss of $0.40 per hour for 1200 actual direct labor hours		480
4. *Indirect manufacturing expense level,* or indirect manufacturing expense budget ($1800), less actual indirect manufacturing expense ($1200)	$600	
5. *Cost of idle machine capacity,* or machine capacity hours (1000), less actual machine hours (800), equals 200 idle machine hours at $1.80 per hour		360
6. *Total variations*	$600	$1170
7. Net departmental profit or loss		$570

b. As a mathematical check of the above net loss.

1. Actual direct labor payroll	$1440
2. Actual indirect manufacturing expense	1200
3. Total actual cost	2640
4. Standard direct labor cost	720
5. Standard indirect manufacturing expense	1350
6. Total standard cost	2070
7. Total actual cost less total standard cost	570

Prepared by Bruno A. Moski, Jr., Plant Manager, The American Paper Goods Company, Kensington, Conn.

Dumore* keeps your costs On the Groove

...by saving you time and money on your grinding, drilling, and light milling jobs

The Joyce-Cridland Company can tell you about cutting costs with a Dumore. They make jacks and auto lifts. Accurate grinding of ball races gave them quite a headache. First they tried hand-polishing after roughing out on a lathe. That cost them too much. Then they tried an air grinder. That tool wore out quickly on this tough job.

But the third try was a charm. They mounted a Dumore No. 7 (¾ HP) on a 40 year old lathe. This set up gave them a perfect job — and continues to do so after more than 2 years. What's more, *their cost is only 53¢ a part (of which 45¢ is for labor)!*

Keeping costs down is often secondary to doing a job right — but a Dumore does both for you.

You too, can cut your costs with Dumores!

You know about Dumore's dependable precision for toolroom grinding. But that's only half the story. You can do so many different toolroom, maintenance, and production jobs with a Dumore that it is now a "universal" shop tool.

You can use a Dumore for all kinds of grinding — external, internal, surface, tool, and thread. You can set up a Dumore for drilling and light milling, too. A Dumore converts your standard machine tools into precision grinders. A Dumore is a top-notch work-head for special set-ups you can build at low cost. Quite often, a Dumore can help you avoid buying a high-priced machine.

Plan to do *more* with Dumores! See your Dumore distributor today. Ask him to tell you the complete Dumore story. There are 7 models, with interchangeable quills for work to 24" depths, at speeds up to 42,500 rpm, with ±.0001" precision. And don't forget Dumore Handgrinders and other tools. They help you cut your cost on many jobs, too!

FREE ... Complete certified report on this Dumore job is yours for the asking!

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Yes, I'm interested in cutting costs and doing a better job!

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☐ Send me your certified report of Dumore grinding at Joyce-Cridland Co., Dayton, Ohio.

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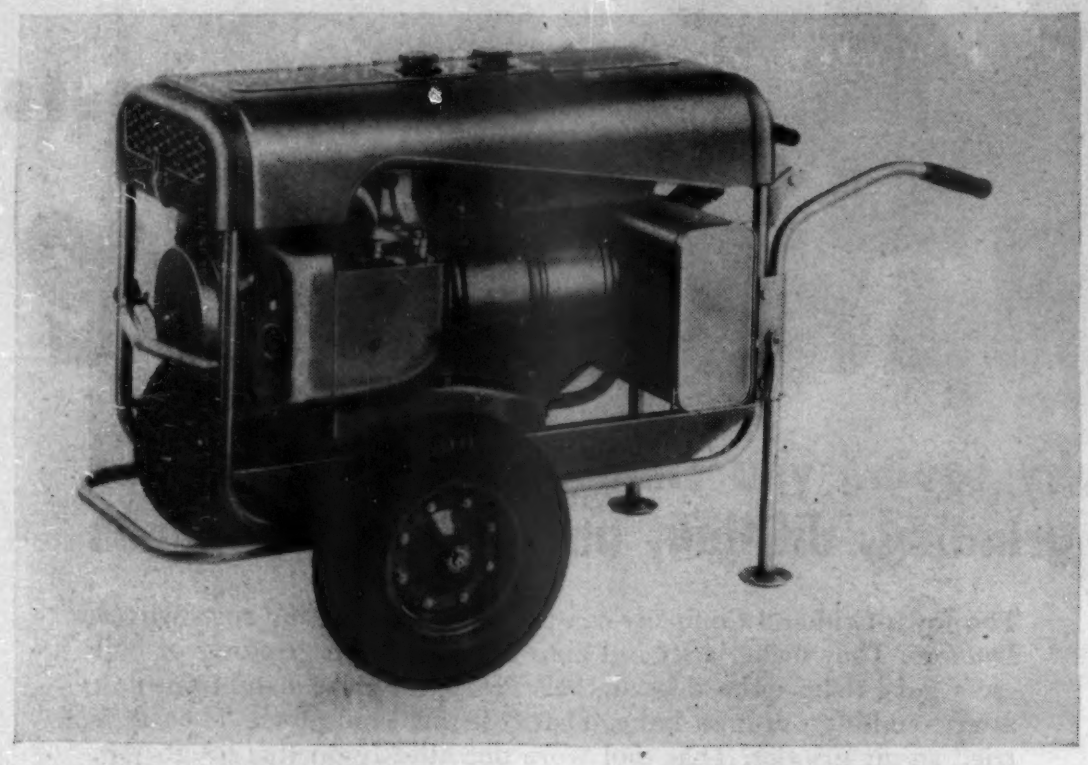
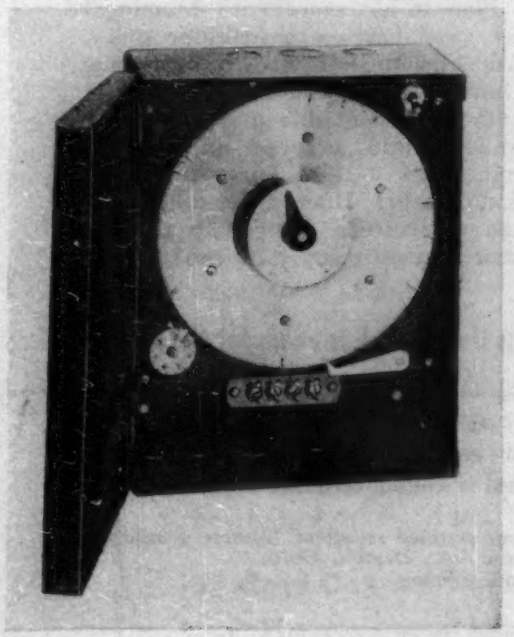
WHAT'S NEW IN EQUIPMENT

Briefed here—for the convenience of plant operating men—are descriptions of industrial plant equipment newly placed on the market



Portable D.C. Welder

Portable 150-amp. d.c. welding outfit, gasoline powered, called Sureweld, is small enough to be stowed into small trucks for transportation. It weighs 330 pounds, is suitable for use on "big inch" pipe, rail-frogs, switch points, and other heavy or light weldable material or equipment. The 10-hp. air-cooled 2-cylinder 4-cycle engine weighs 97 pounds, features aluminum construction, pressure lubrication, Stellite exhaust valves and seat inserts. Built-in dual control is standard equipment. Main current tap has 8 settings ranging from 45 to 180 amperes; the fine current control provides wide latitude of control between main tap settings. A duplex Twistite receptacle, located on the control box, permits direct plug-in of two extension lights. D. W. Onan & Sons, Inc., Minneapolis 5.



Timers

Suitable for use with permanent conduit or BX installations in standard switchbox cases, TP and TS timers are enclosed in steel cases. Dual-disk face on the case permits setting up of any required program. Model TP is designed for bell ringing or signaling purposes; will make a single circuit contact at any 5-min. interval during a 24-hour period and repeat each day. Adjustable from 1 to 30 seconds. Model TS is a control timer which incorporates a holding circuit. It closes the circuit on the first impulse and opens it on the succeeding impulse. Will automatically repeat at prescribed intervals. Montgomery Mfg. Co., 549 West Washington Blvd., Chicago 6.

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Matting

Thermoplastic matting is suitable for use where acids or oils are present, or in locations where matting is given rigorous service. Manufacturer says it will lie flat and hug the floor. Manufactured in black and brown, it is 3/32 inch thick by 36 inches wide, and comes in rolls 25 to 35 yards long. The B. F. Goodrich Co., Akron.

Protective Compound

Rubber-base coating is designed to fill, seal, prime, and finish all types of porous masonry, including cinder cement blocks and stucco. It dries quickly, according to manufacturer, and is easily brushed on. Also suitable for use as a cement grout on exterior work, and is waterproof, damp-proof, and alkali resistant. The Wilbur & Williams Co., Greenleaf & Leon Sts., Boston 15.

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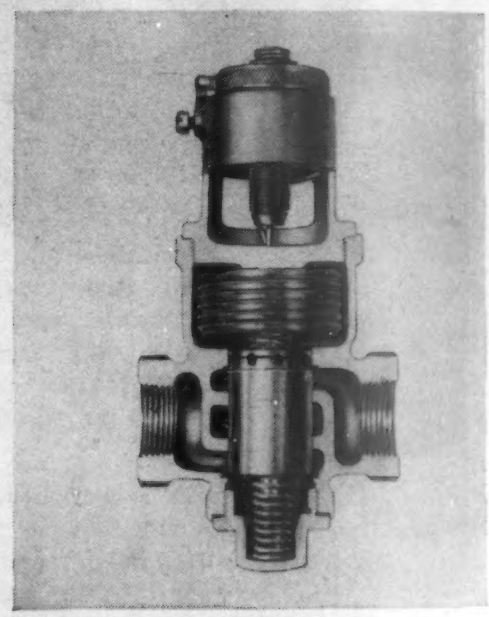

Water Temperature Control Valve

Designed to maintain constant predetermined water temperatures, regardless of heater tank or tankless heater temperature variations, valve may be installed anywhere along the line for zone control. It automatically compensates for normal pressure fluctuations, according to manufacturer. Solid fill bellows which actuate the valve are mounted out of the water in a protected chamber open to atmosphere. Valve may be set for any discharge temperature between 100 and 170 deg. F. Dial is calibrated in 10-deg. units with a 5-deg. space between. Made in two sizes; ¾-in. model has capacity of approximately 20 g.p.m. at 50 p.s.i.; 1-in. size 35 g.p.m. at 50 p.s.i. Symmons Engineering Co., Boston.

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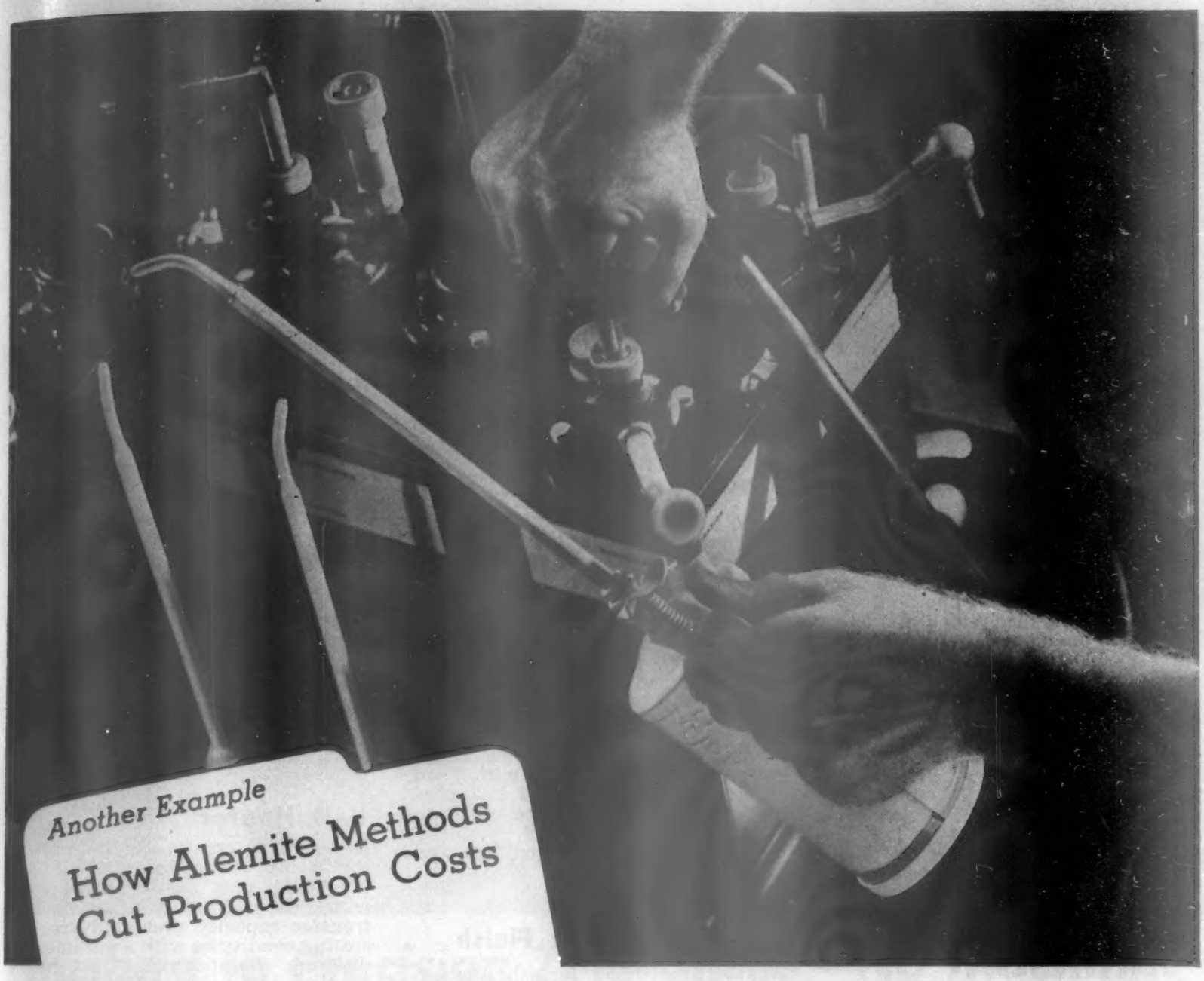
Rubber-Insulated Wire

Electrical wire with rubber insulation that is said to improve when soaked in water was developed for use underground and in locations where high moisture resistance is required. Wire is coated with natural rubber latex compound, called Laytex RUW, applied by the dip process. Insulation is also said to have im-



Another Example

How Alemite Methods Cut Production Costs

Slashes Downtime for Lubrication Up to 35.3%

Adds More Productive Time to Machines by Mechanizing the Handling and Application of Lubricants

Your machines demand many different types and grades of oils and greases. That's why you need an Alemite LubriKart—a complete, portable lubrication department on wheels. Everything an oiler needs is within arm's reach. Result—he can service any machine in as much as 35.3% less time—adding more productive time to each machine.

This is just one of many Alemite Methods that help to cut production costs. And the Alemite Representative can quickly prove that his simplification of lubrication procedures definitely reduces maintenance costs in any plant, large or small.

He can show you case after case where a time study analysis proves that Alemite Methods eliminate costly, time-consuming handling of greases and oils. His methods completely mechanize lubrication from-barrel-to-bearing...keep dirt out of grease . . . reduce bearing failures. He can show you how to lubricate as many as 300 bearings from *one* safe central point while the machines keep on producing! Get the complete facts today!

Your Lubrication Methods May Be More Antiquated Than You Suspect

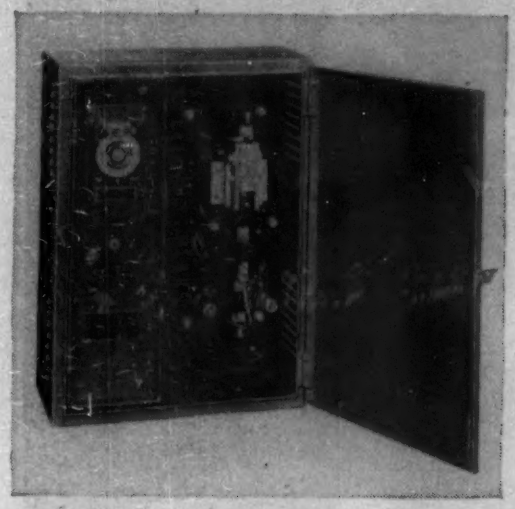
Shown above is an Alemite LubriKart being used to fill a gear case. Compare this modern, compact, efficient unit with your own lubrication methods. If yours fall short—remember that the Alemite Representative is a specialist in modern methods of handling and applying lubricants. A five minute conference with him may open your eyes to new cost-cutting ideas. Call your Alemite jobber or write to Alemite, 1870 Diversey Parkway, Chicago 14, Illinois.

ALEMITE

Another Product of STEWART WARNER

MODERN LUBRICATION METHODS THAT CUT PRODUCTION COSTS

proved tensile strength and elongation. U. S. Rubber Co., Rockefeller Center, New York.

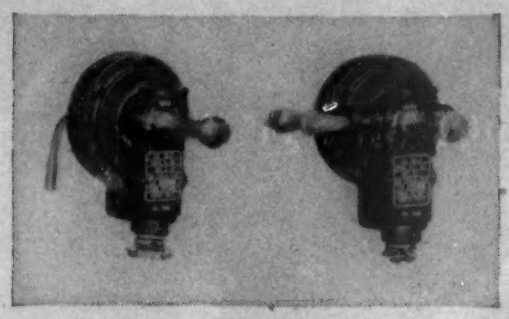


Welder Controller

Class 8992 Type BBG-1 combination unit provides electrical control for a small foot- or motor-operated resistance welding machine. Contains a NEMA 1A pneumatic weld timer, a size 1W, 100-amp. high-speed magnetic welder contactor, and a control transformer. Initiating switch and control circuits operate at 110 volts isolated from the power supply. Timer is mounted on a "Safront" swingout panel with adjusting dial in the front and all energized parts in the rear. A dual primary control transformer may be connected for 110, 220, or 440 volts 60 cycles, or for 380 volts 50 cycles. Square D Co., 4041 North Richards St., Milwaukee 12.

Marking Paint

Suitable for marking storage bays, aisles, stock locations, equipment clearance limits, and traffic lanes, marking paint is heavily based with fine silica, making it non-slippery. It comes in white and yellow, in 1-, and 5-gal. cans. Manufacturer states that it resists strong cleaners, and retains its color and visibility after repeated scrubbings. The Wilbur & Williams Co., Greenleaf & Leon Sts., Boston 15.



Pressure Controls

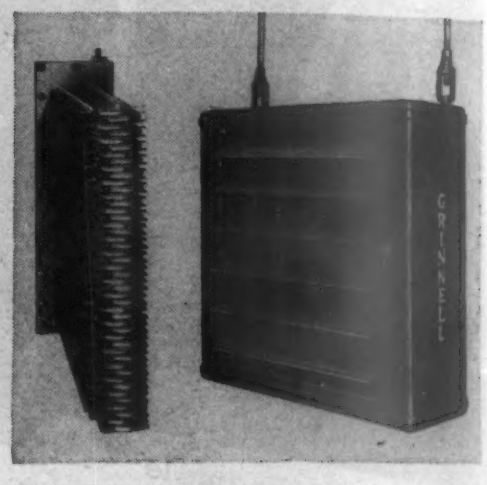
Static pressure controls are designed for application on low pressures where regulation is required in inches of water, either pressure or vacuum. May be used for regulation of liquid level from slight changes in head pressure, signal, or safety device in event of excessively high or low pressures, for controlling the static pressure in the discharge duct of a fan, and so on. Units are small, and obtainable in standard ratings ranging up to 20 inches of water pressure or vacuum, and with fixed differentials from 0.2 to 2 inches of water. Installation may be made on any vertical wall or duct, manufacturer states. Coral Designs, P.O. Box 248, Forest Hills, N. Y.

Asbestos Shingle Finish

Weatherproof finish for asbestos siding and shingles, called "Shingle-Seal," is designed to protect and decorate asbestos siding and shingles, both old and new, exterior and interior. It is claimed to be resistant to atmospheric conditions. No priming is necessary, and it is available in bright white, oyster white, and stone gray. Can be applied by brush or spray, and 1 gallon is said to cover 450 square feet. Dewatex Mfg. Corp., 42nd St., & Dyer Ave., New York 18.

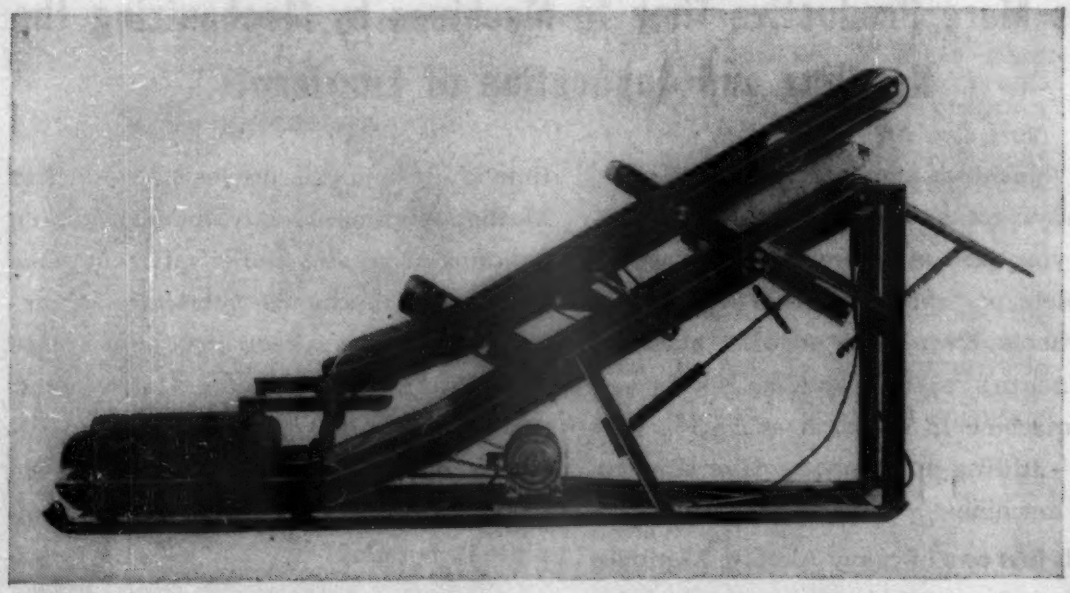
Shutoff Valve

Injection sealing is said to take care of emergency shutoff valve operation and permit safe handling of hot acids, strong or corrosive solutions, hydrocarbons, and other penetrative fluids. Available in ½- to 10-in. sizes with choice of standard flange connections. Sellers Injector Corp., 1605 Hamilton St., Philadelphia 30.



Unit Heater

Designed to cope with atmospheric conditions where dust and lint are prevalent, unit heated called Thermolier is said to maintain its heat transfer capacity under adverse operating conditions with a minimum of cleaning maintenance. Unit has a heating rate of 113,700 B.t.u. per hour, using steam at 2-lb. pressure and entering air at 60 deg. F. With steam at 25-lb. pressure, unit delivers 143,400 B.t.u. per hour. Features include U-tube construction and patented cooling leg. Grinnell Co., Inc., Providence, R. I.



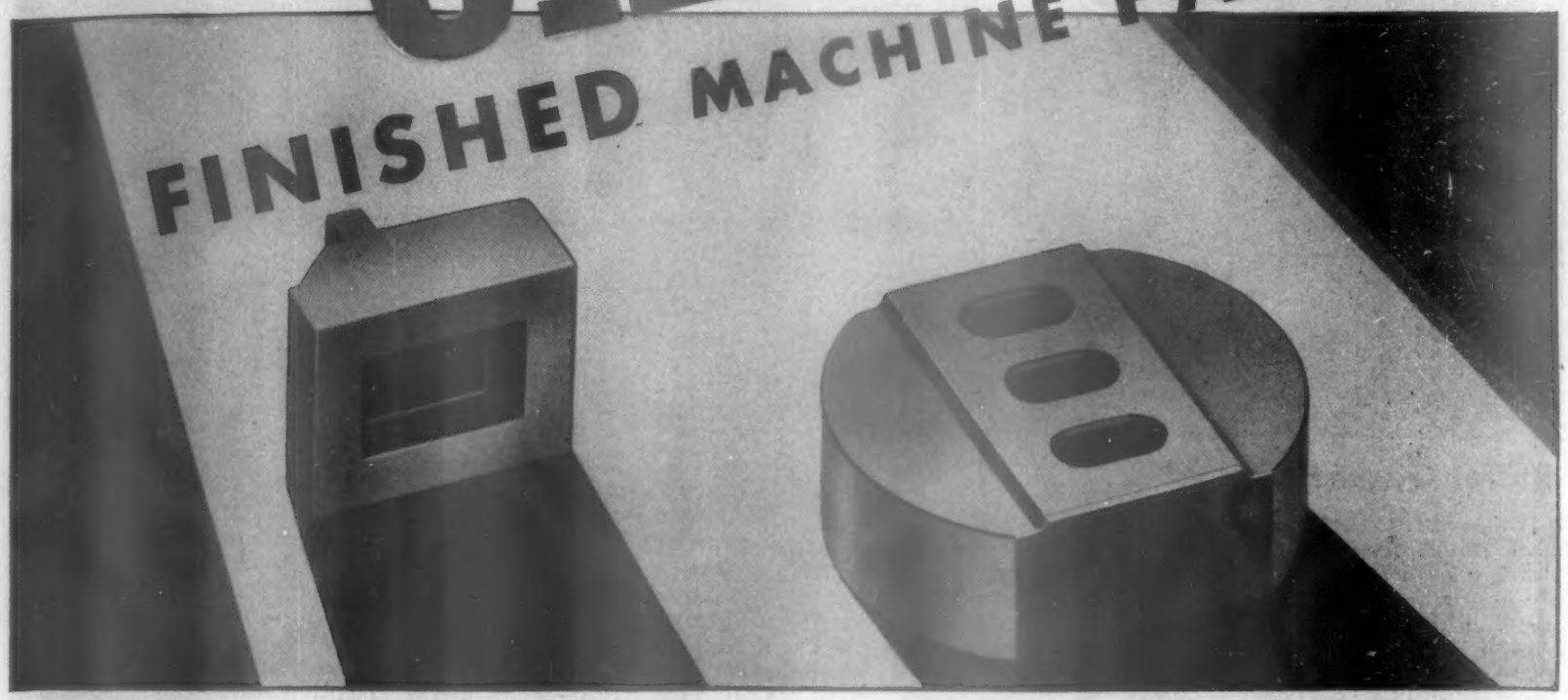
Bag Flatteners

Portable bag flattener has endless steel coil springs running over grooved steel rollers, powered by an electric motor. Racker arm connection between the hugger boom and lower conveyor eliminates air from the bags, making them lie flat and smooth. The hugger boom is adjustable up and down for bags of various thicknesses. Available with swivel casters or pneumatic tires, or may be used on skids. Flexoveyor Mfg. Co., 315 E. & C. Bldg., Denver, Colo.

Welding Hand Shield

Made for operations where a welding helmet is not practical, and on

No TOOLING Program with OILITE FINISHED MACHINE PARTS



Finished to Precision Tolerances—No Machining

Eliminating tooling programs will save capital investment, time, floor space, and expense.
With OILITE, Engineers and manufacturers enjoy a NEW freedom of design.
Parts impossible to machine economically can often be made readily, by OILITE powder metallurgy.
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Note the depression and elliptical bores in the parts shown above.

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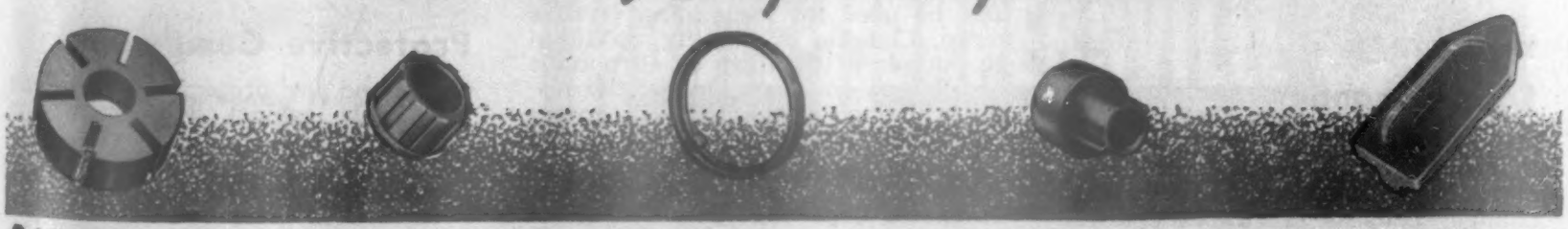
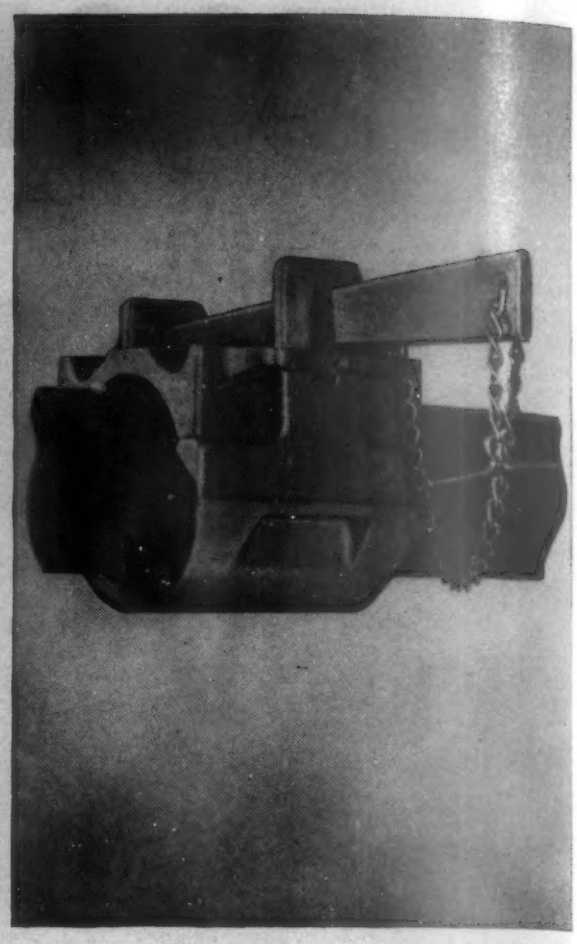
Division of Chrysler Corporation



FIELD ENGINEERS AND SUPPLY DEPOTS IN PRINCIPAL CITIES



Buffer Gasket

For use in all-metal, glass, or porcelain lined pipeline coupling operations, gasket features a special buffer ridge projecting inwardly from a solid rubber wall. Pipe ends, when joined butt against this ridge, which absorbs shock and prevents them from grinding together, cracking, or chipping. Ridge also serves to prevent a drop-off at this point. Supplied with wedge-type couplings, which are tightened with a hammer applied to the wedge key after the two sections are fitted over the ends of the pipe. Manufacturer states that they will withstand pressure over 300 p.s.i. The Butyl and Buna-N compounds used in the gaskets, called Presto-Lock are said to be suitable for use at temperatures up to 180 deg. F. Available in seven sizes, ranging from 1¼ to 6 inches. Sizes 1¼ to 3 inches have one wedge secured by a chain assembly; 4- and 6-in. couplings have two wedge keys. Drinkwater, Inc., Spring & Madison Sts., Waukegan, Ill.

tack welding and set-up work, lightweight seamless welding hand shield is made in one piece from special fiber. The steel welding-glass holder is insulated and rivetless. The fiber handle is 5½ inches long. Without glass, shield weighs 11 ounces. Available with standard Noviweld or Filterweld glass plates. American Optical Co., Southbridge, Mass.

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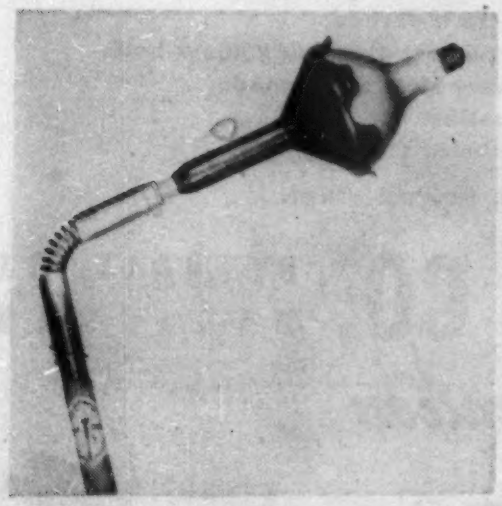


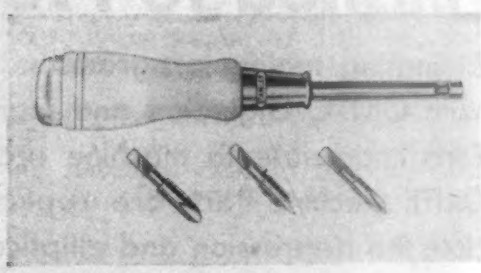
Lamp Changer

For changing electric light bulbs and removing broken lamp bases, without ladders or staging, insulated lamp changer consists of rubber changer heads of various sizes, lightweight hardwood sectional poles, and a straight or angle adapter which joins the changer heads to the poles. Changer operates by sliding the rubber changer head, locked to the pole by the adapter, over the lamp to be replaced. A twist of the wrist brings the light bulb in or out of the socket. The angle adapter makes it possible to reach lamps mounted at angles up to 90 degrees. Special heads handle the PAR-38 and R-40 reflector lamps and screw-type tubular mercury-vapor floor lamps and vapor-proof globes and guards. By reversing the rubber changer head on the adapter, the tapered end can be fitted into a broken lamp base, which can then be twisted out by friction. Chadsey Corp., P. O. Box 1858, Hartford 1, Conn.

•

Magnetic Sweeper

Known as the Magna-Sweep, magnetic sweeper consists of a permanent plate magnet mounted on wheels for pushing over the floor or ground to pick up iron or steel particles. Can also be used for reclaiming ferrous scrap. Capable of picking up 10 to 20 pounds of turnings or 40 pounds of plate in one load. One of the features claimed is simplicity of operation and cleaning. Available in two sizes; size *A* is based on a 12-in. magnet; size *B* on a 24-in. magnet. Dings Magnetic Separator Co., 4740 West McGeogh Ave., Milwaukee 4.



Tool Holder

Replaceable bit screwdriver, No. 88, for driving both Phillips and slotted-head screws, features a hollow hardwood handle compartment. This contains three bits, two for Phillips screws, and one for slotted screws. Chuck for holding bit is forged as an integral part of the tempered alloy steel bar which is fastened to the hardwood handle. Storage compartment in handle is closed at the end with aluminum screwcap. Other bits to fit the tool holder for use on screws of different sizes are also available. Stanley Tools, New Britain, Conn.

•

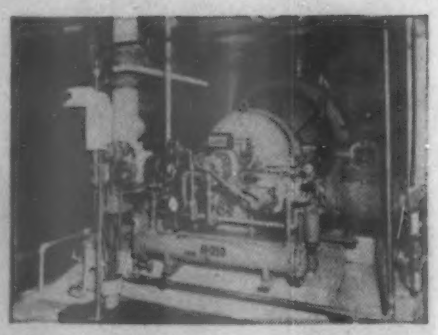
Protective Compound

Compound for protecting wire rope and cable against deterioration is called the LSS. Said to extend the serviceability of rope or cable by preventing rust and by lubricating the wire strands to reduce friction and internal stresses. Compound is a

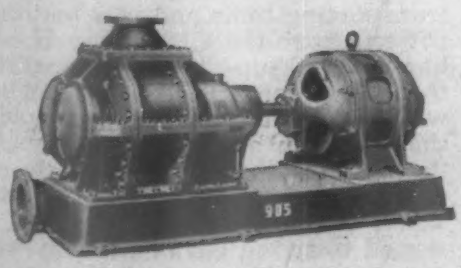
In 1865, William Bullock built the first press which printed from a continuous paper web or roll. Eleven years earlier, in 1854, the first Roots Blower was built. We're not good because we're old, but old because we're good.

R-C dual-ability

HELPS DELIVER NEWS OF THE WORLD



R-C Centrifugal Unit (capacity 12,000 CFM), for vacuum service on central system of a large paper mill.



R-C Cycloidal Vacuum Pump (capacity 1,000 CFM), for use with paper mill flat boxes. Compound units of a similar type are used on suction and press rolls.

Papermaking and printing processes require extensive use of equipment to move air. For dependability and economy, blowers and vacuum pumps must be carefully selected and matched to the specific jobs to be done.

That's where *R-C dual-ability* counts most. Because we build both Centrifugal and Rotary Positive units, we can supply whichever type best meets the needs, in capacity, pressure and other characteristics. This *dual choice* is an exclusive Roots-Connersville advantage, one which frequently results in saving time, trouble and money.

If your business calls for the moving, mixing or measuring of air, gas or viscous liquids, consult Roots-Connersville. Almost a century of blower-building experience, plus alert, forward-looking engineering, assure you of sound, practical, economical answers to your equipment problems.

ROOTS-CONNERSVILLE BLOWER CORPORATION
809 Central Avenue, Connersville, Indiana

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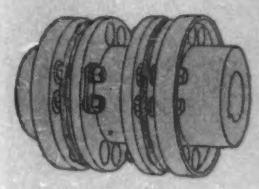
BLOWER BUILDERS · R-C · SINCE 1854
BLOWERS · EXHAUSTERS · BOOSTERS · LIQUID AND VACUUM PUMPS · METERS · INERT GAS GENERATORS

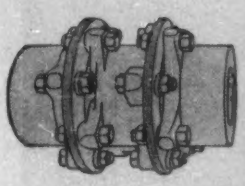
★ ★ ONE OF THE DRESSER INDUSTRIES ★ ★

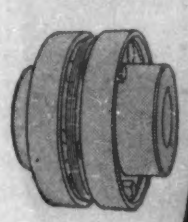
THOMAS Flexible ALL METAL COUPLINGS

Engineered to stand up on the toughest jobs, Thomas Flexible Couplings do not depend on springs, gears, rubber or grids to drive. All power is transmitted by direct pull.



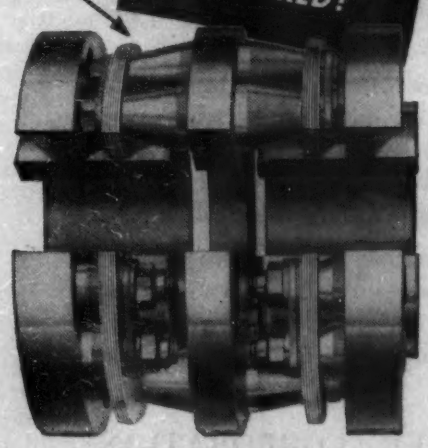
The standard line of Thomas Couplings meets practically all requirements. But if unusual conditions exist we are equipped to engineer and build special couplings.





BACKLASH FRICTION WEAR and CROSS-PULL are eliminated NO LUBRICATION REQUIRED!

PATENTED FLEXIBLE DISCS



THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT

Write for New Engineering Catalog

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

blend of high-melting petroleum lubricants, anti-corrosion agents, and finely dispersed pigments. Manufacturer claims that it withstands high temperatures, will not deteriorate on exposure to salt water spray, corrosive fumes or vapors, and that internal movement in the rope or cable will not displace the coating. Will dry tack-free in 24 hours. Can be supplied in any color. White Oil & Petrolatum Div., L. Sonneborn Sons, Inc., 88 Lexington Ave., New York.

•

Counter

Type 82-A single control register is a double counter. The upper set of figures, ⅞ inch high, records a count up to 999. This total may be returned to zero at any time, at the end of a shift, a run, or the completion of a count. The lower set of figures, 9/16 inch high, gives a grand total, and is accumulative up to 99,999, then automatically turns over to zero. Operated by a lever at the right which may be moved by hand or actuated by any mechanism with a reciprocating motion, the counter can be fitted with a bell to ring at each operation. Ohmer Corp., Box 998, Dayton.

•

Smoke Density Recorder

For measuring and recording the density of smoke or dust in flues or ducts, instrument consists of a standard Bailey electronic recorder, a bolometer type smoke detector, and a sealed beam light source. The smoke detector and the light source are installed on opposite sides of the smoke passage so that the beam from the light source is directed at the tungsten filament in the bolometer. The filament temperature is measured by the electronic recorder in terms of smoke density. A temperature compensating circuit is said to eliminate errors caused by high ambient temperatures and be unaffected by normal voltage variations. Two smoke detectors may be connected to a two-pen recorder to record the smoke density in two different flues. Each measuring circuit may be equipped with switches to actuate signals or alarms when the smoke density reaches a predetermined maximum value. They also may be equipped with control to turn on over-fire jets automatically. Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10.

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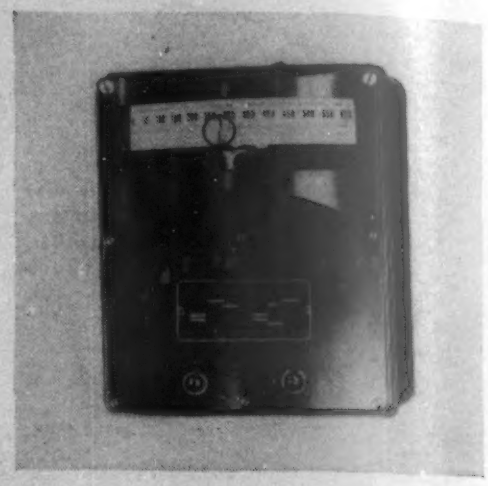

Pyrometer Controller

Proportional current-input electronic pyrometer controller, Model IE486, is said to proportion the current input to electrically heated furnaces, ovens, plastic molding machines, and similar equipment to provide practically straight-line temperature control. This control is achieved by time modulation of the input energy. The average energy supplied is proportional to the deviation of the temperature from the control point throughout a band width, which is adjustable from 0 to 2½ per cent of full scale reading. The Bristol Co., Waterbury 91, Conn.

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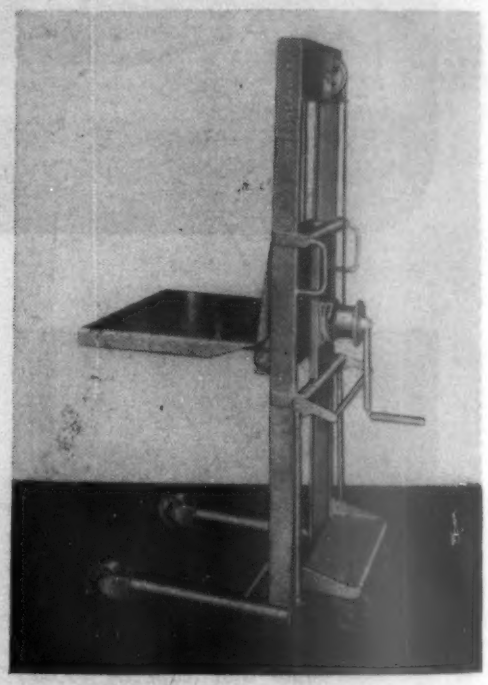
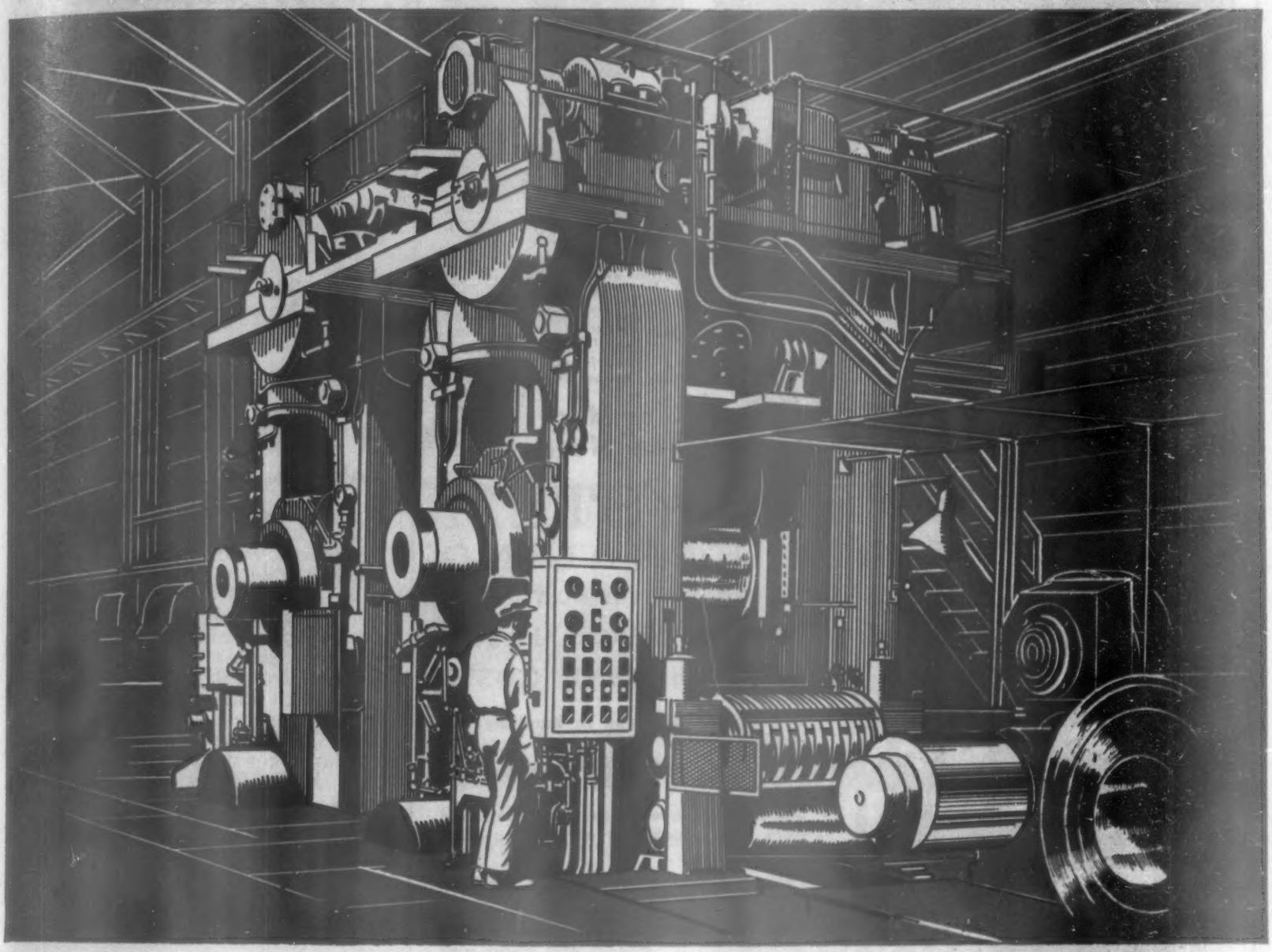


Lift Truck

Designed for lifting, lowering, and transporting tools and raw materials, lift truck, called CH Handy Hoister, has a crank-up-and-down operation through planetary gear drive winch, which permits placing and holding the platform at any level. Manufacturer states that winch handle cannot spin or get away from operator when lowering load, and it is designed to swing out of the way when not in use. One revolution of the handle results in a 3-in. lift. Wheels, casters, and sheave turn on roller bearings. Platform of reinforced sheet steel rolls on guide wheels equipped with ball bearings and safety guards. Carriage backplate is

YES! Tycol Apreslube Lubricants perform better . . . BETTER . . . BETTER



Tycol Apreslube Lubricants perform better because:

. . . *Tycol Apreslubes* are extreme pressure lubricants that stand up under severe heat and moisture conditions, under tremendous loads.

. . . *Tycol Apreslubes* are highly stable, will not separate while in storage or service. They inhibit against corrosion even in presence of water.

. . . *Tycol Apreslubes* mean lower lubrication costs . . . longer service life for your equipment.

. . . *Tycol Apreslubes* never thin unduly at high temperatures. They guard against overheating and excessive wear in gears and bearings.

Your nearest Tide Water Associated Office is ready to help you select that Tycol Apreslube lubricant best suited for your particular need. Call or write today.

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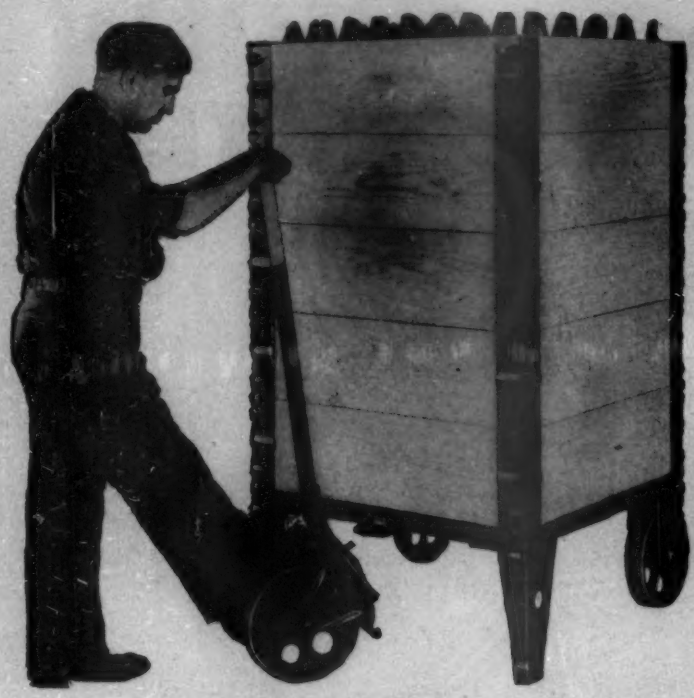
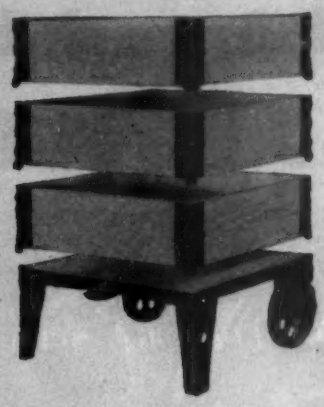
LUBRICATION — "ENGINEERED TO FIT THE JOB"



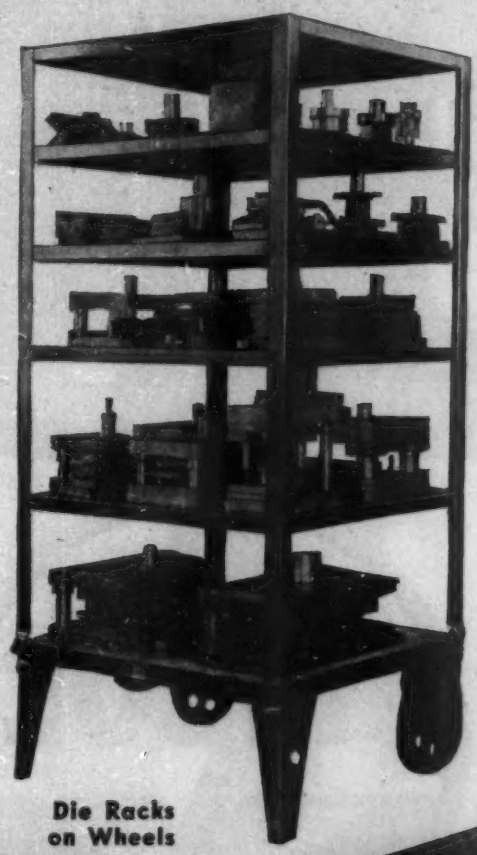


Bin Sections, either wood or steel, are removed as load diminishes, added as load increases. Always the RIGHT SIZE bin.

"DELIVER THE BIN AND SAVE THE HANDLING." Wooden Side or All-Steel Bin Sections, Racks, Trays and Die Tables fit on the Turner Transport which is moved by hand Jimmy, power lift truck, crane or tractor.

If Your Handling Costs Are 20% or More of Your Production Dollar—You Need

THE TURNER SYSTEM
OF MATERIALS HANDLING



because it saves up to 50% in FLOOR SPACE, LABOR AND EQUIPMENT COSTS

- Co-ordinates all steps in handling materials.
- Provides vertical expansion of loads to ceiling.
- Standardizes every Box, Bin, Shelf and Rack . . . makes every unit quickly movable.
- Puts all materials within arms' reach of the operator.
- Lasts indefinitely . . . every unit welded or riveted . . . wheels and roller pins only moving parts.

FREE BOOK EXPLAINS THE TURNER SYSTEM

Hundreds of manufacturers have already benefited from this free book which outlines the TURNER SYSTEM and describes a plan which cuts labor, handling and storage expense, speeds production and reduces accidents. Write for your copy today.

Die Racks on Wheels

You move dies without waiting for lift trucks when you have Turner System Die Racks mounted on Transports.

When You Write for the Turner System Book also ask for our 60-Day Trial Plan

New, Rugged, 8-Way, Stacking Pallets Save Replacement Costs

If you have been throwing money away on expendable pallets you can make big savings with Turner Pallets which stand up for years, work with hand or power lift trucks, stack on themselves or on other units.

FACTORY SERVICE COMPANY

4605 NORTH TWENTY-FIRST STREET MILWAUKEE 9, WISCONSIN

integral with platform; base, of open-end type, straddles machines or other obstacles. Arc-welded tubular base members resist twisting of framework, prevent weaving of upright members. Standard 500-lb.-capacity model has 24x24-in. lifting platform, 5½-in. lowered height, 58-in. lifting height, 71-in. over-all height, and 5-in. steel, rubber-tired, or molded plastic wheels. Lewis-Shepard Products, Inc., 279 Walnut St., Watertown 72, Mass.

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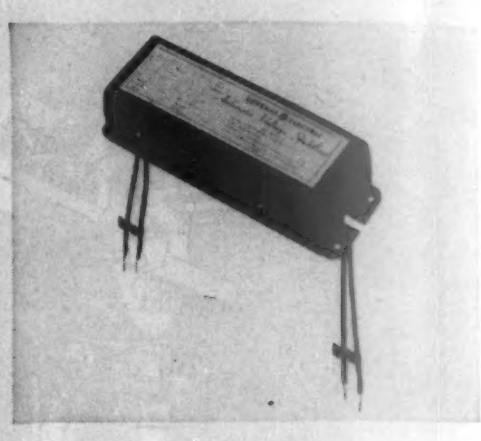

Voltage Stabilizers

Three voltage stabilizer units have been added to company's standard automatic voltage stabilizer line—115-volt, 60-cycle designs in 15, 25, and 50 va. ratings. They provide a steady output of 115 volts (plus or minus 1 per cent for fixed unity power factor loads) with input voltages ranging from 95 to 130 volts. Low case height and small size make them suitable for shallow depth installation. Other features include totally insulated construction and universal type leads. There are no moving parts, and operation is automatic. General Electric Co., Schenectady 5.

•

Photo Copying Machine

Intended for moderate volume print production, Model 21 BW Whiteprinter can be used to reproduce engineering drawings in ink or pencil, printed or typewritten office forms, and other material from translucent or transparent originals. Continuous in operation the printer exposes and develops cut sheets or roll stock of any length and up to 42 inches wide. Printing speed ranges from 6 inches to 4 feet per minute,

Modernize Your *Track Switches* with

PETTIBONE MULLIKEN
HUB SAFETY SWITCH STANDS

it looks like an ordinary switch stand, but

it permits trailing movements without slowing or stopping for hand operation of the switch—it is automatic, the switch is thrown without damage to the switch or switch stand.

it eliminates replacement of broken parts caused by running through a switch—it reduces maintenance.

it does away with tying up yard tracks when an ordinary switch stand would be run through and put out of service—it speeds switching.

the handle does not swing over when the switch and target move to the new position—it is safe, the handle can not strike a bystander.

it is fully enclosed as a protection against dirt, snow, and ice.

it is well built to last indefinitely with minimum attention.

it is easily installed in place of your present ordinary switch stand.

LEADING RAILROADS USE THESE AUTOMATIC SWITCH STANDS IN SWITCH YARDS
OVER 20,000 IN USE BY RAILROADS AND INDUSTRIAL PLANTS

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RAIL BRACES • SHOULDER BOLTS • FROGS • SWITCHES • RERAILERS • SWITCH STANDS • MECHANICAL SWITCHMAN (SPRING SWITCHES)

depending on the transparency of the original. Controls are simple, and machine can be run by one operator. Light source for exposure is a stationary 1200-watt glass mercury arc lamp mounted within a cylinder. Built-in constant voltage transformer enables lamp to operate effectively, regardless of line voltage changes within a 30-volt range. No plumbing connections or exhaust ducts are required. Black, blue, red, or brown lines can be printed on white, green, pink, or yellow backgrounds. Transparent paper, cloth, and matte film also can be exposed and developed. Charles Bruning Co., Inc., 4754-22 Montrose Ave., Chicago 41.

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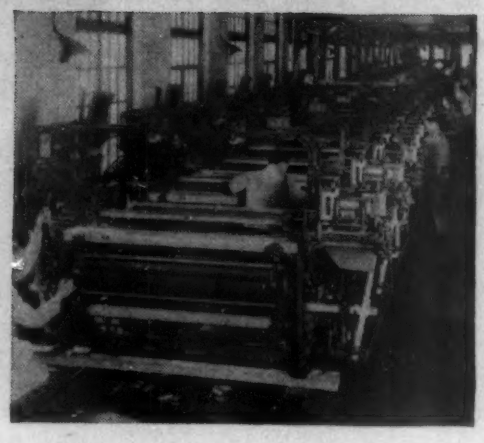


Low Tool Cost aids high volume, low cost Textile Loom Production

Mr. O. V. Payne, Works Manager, Crompton & Knowles Loom Works, Worcester, Mass. highlights cost reducing McCaskey Tool Control in this way:

"We have used McCaskey Methods in our main tool crib and three of our subsidiary cribs since 1941. The manufacture of over 100,000 textile loom components has benefitted by speedier tool service and lower tool costs.

"Specifically McCaskey has: (1) Speeded up tool crib operation, (2) tied responsibility for specific tools to specific employees, (3) location of all tools on the floor can be speedily ascertained, (4) cut our tool inventory by disclosing dead and infrequently used tools, (5) cut excessive inventory of many active items, and (6) provided us with the medium for detailed analysis of tool loss, breakage, use and performance . . . all contributing to low tool costs."

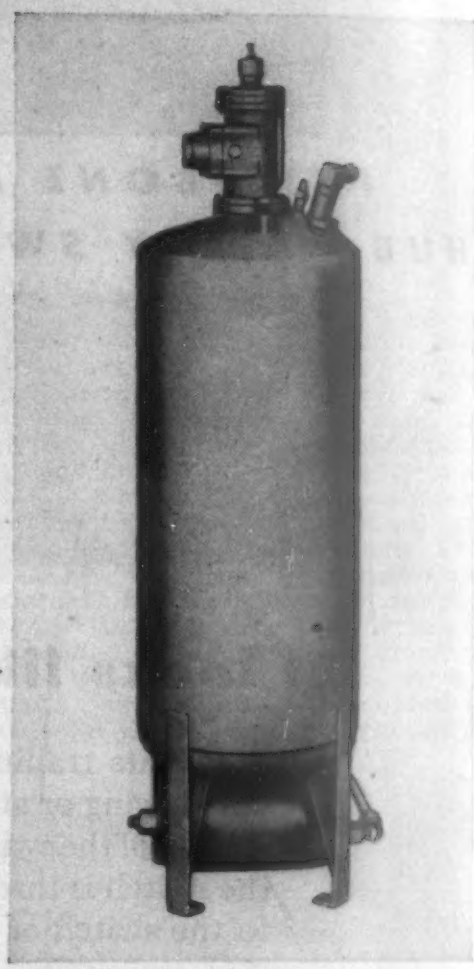
Let us have a qualified representative explain how McCaskey Control will save from the beginning in your plant . . . or send you proof of McCaskey savings in several other well-known plants.

McCaskey INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada — The McCaskey Register Co., Watford, England



Water Cooler

Water coils, in high-capacity, tank-type water cooler, called Temprite, are submerged in liquid refrigerant. The heat of the water being used passes directly into main body of refrigerant. Thus, according to manufacturer, it is possible to have a complete system using relatively small tanks where water is used intermittently in large quantities. Cooler is 14 inches in diameter by 54 inches high. Cools alcohol, light oils, chemical solutions, and other liquids. With a 60-deg. inlet temperature, it delivers 1185 gallons of 40-deg. water per hour. Automatic control valve is said to maintain constant water temperature whether 1 gallon or full load is being cooled. Temprite Products Corp., 35 Piquette Ave., Detroit 2.

•

Lampholder Adjusters

Spring-action lampholder adjusters are designed to provide positive electrical contact for both old and new

fluorescent fixtures, to eliminate the possibility of falling lamps, and to correct inaccuracies in lampholder location. "Feet" on the adjusters act as permanent wedges or walls, says manufacturer, and counteract effects of vibration or fixture warpage by holding the lampholder rigidly. Can be installed on any type of fluorescent lampholder, the only tool needed being a screwdriver. Allied Electric Products, Inc., Irvington, N.J.

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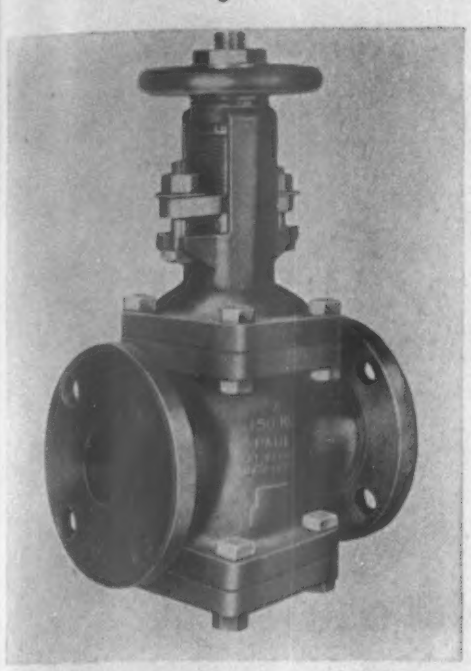


Corrosion-Resistant Valve

Self-flushing "straight-through" valve, lined with hard rubber, is suitable for use wherever resistance to corrosion is a factor. The venturi body design is said to insure negligible pressure drop, straight line throttling, and high coefficient of discharge. Cast-iron body, flanges, and all working parts are covered with hard rubber which affords protection against almost all acid and alkaline solutions used in industrial processes, according to the manufacturer. The valve is double seated, and may be installed in any position in the line. Should seat wear occur after constant use, the body may be turned end for end and the other seat utilized. Available up to 4 inches, handling 150 p.s.i. line pressure; flanged and faced to ASA BI 6a. 125-lb. series standards. Larger sizes available on order. American Hard Rubber Co., 11 Mercer St., New York.

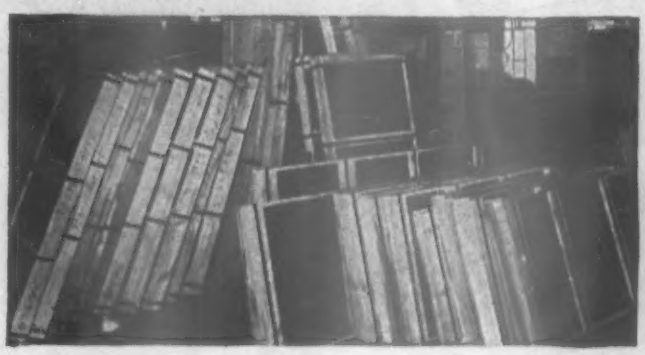
•

Pilot Light

A specially designed cap, called Multivue, refracts the light from glowing electrodes in pilot light so that a multiple image is seen from any viewing angle, states the manufacturer. It was designed to be used with the NE-51 neon glow lamp. The

HOW ACME STEELSTRAP INCREASED SHIPPING EFFICIENCY

50% stronger crates . . . 288% faster to build . . . costs 31% less with Acme Steelstrap



NEW WAY—Sheets are neatly packaged for safe delivery in 31-lb. Acme standardized crate.

OLD WAY—Sheets were shipped in clumsy 70-lb. wooden crates that were built slowly at high cost. Production: 45 crates daily.

NOW—130 new Acme wall-board lined crates are made daily. Acme crate tests 50% stronger.

The Formica Insulation Company, Cincinnati, originated plastic surfacing sheets more than 19 years ago. As builders and manufacturers have learned to put attractive, modern Formica Plastic Surface to a wide variety of uses, the demand has increased to production capacity. Formica consulted Acme shipping specialists for advice on increasing shipping package production.

Acme specialists suggested a new crate which is built on an assembly line, weighs only 31 lbs. (old crate weighed 70 lbs.), costs 31% less and is 50% stronger.

These Acme specialists are located in principal cities. Ask one to meet with your company to discuss your shipping problems without obligation.

Read about actual cases in various industries where Acme experts helped effect substantial savings on better shipping. Write or send coupon below for "SAVINGS IN SHIPPING."

Doc. Steelstrap ®

Acme Steel Company, Dept. FM-98
2838 Archer Avenue
Chicago 8, Illinois

Please send me a copy of your case history booklet, "SAVINGS IN SHIPPING."

Name.....

Company.....

Address.....

City.....Zone....State.....

Acme Steelstrap

ACME STEEL CO. CHICAGO

NEW YORK 17 ATLANTA CHICAGO 8 LOS ANGELES 11

How to put faraway suppliers close to "home"

What if suppliers *are* thousands of miles away? When you specify Air Express, you cut down delivery of equipment, supplies and finished products to a matter of hours. Air Express is the *fastest service* there is. Remember—large inventories are expensive. You can keep them low by getting what you need in hours.

Air Express goes on every flight of the Scheduled Airlines—places the most distant suppliers only hours away. And you get fast pick-up and delivery service at no extra cost. Rates are *low*. Use Air Express regularly and keep things hustling.

Specify Air Express-World's Fastest Shipping Service

- Low rates—special pick-up and delivery in principal U. S. towns and cities at no extra cost.
- Moves on all flights of all Scheduled Airlines.
- Air-rail between 22,000 off-airline offices.

True case history: Sacramento, California, dairy regularly gets replacement parts and equipment by Air Express. Keeps inventory low—gets things in hours. Typical shipment: 32 lbs. of parts picked up in Detroit 7 P.M., in use at Sacramento next afternoon. 2039 miles, Air Express charge $19.65. Any distance similarly inexpensive. Phone Air Express Division, Railway Express Agency, for fast shipping action.

AIR EXPRESS

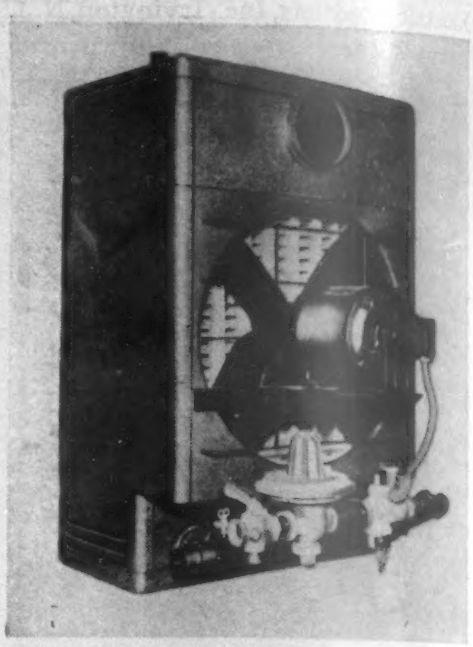
GETS THERE FIRST

Rates include pick-up and delivery door to door in all principal towns and cities

AIR EXPRESS, A SERVICE OF RAILWAY EXPRESS AGENCY AND THE

SCHEDULED AIRLINES OF THE U.S.

resistor for the lamp is built into the assembly, and is proportioned to the voltage and service required. Voltage may be 110 or 220 or higher with a small additional resistor. Connections are made to binding screw terminals, or to soldering lugs which are optional. The lucite caps are made in a full range of colors. The Dial Light Co. of America, Inc., 900 Broadway, New York 3.

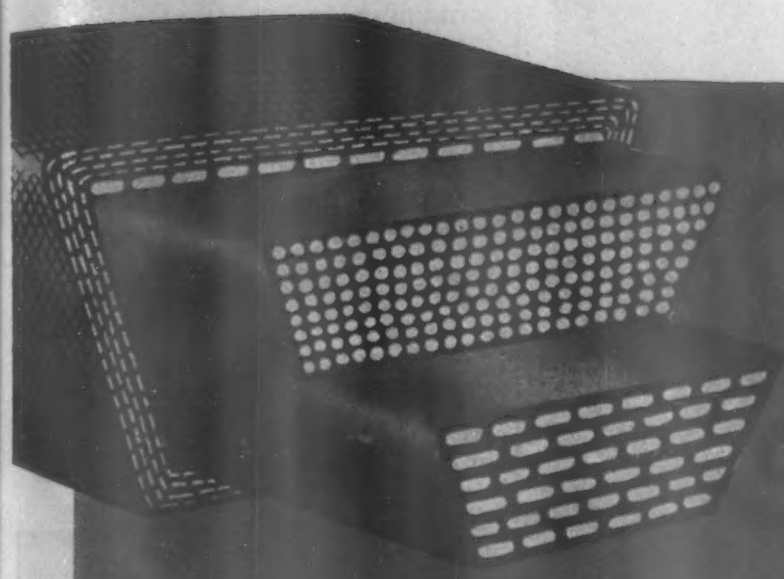


Gas-fired Heaters

Made in one piece, both heat exchanger and combustion chamber of gas-fired unit heaters, called Pittsburgh Series C, feature cast-iron construction. Extended heating surface fins on the heat exchanger are cast integral. A built-in draft hood is said to reduce excessive chimney action. Adjustable horizontal louvers allow warm air to be directed to any desired level. Safety pilot automatically turns off gas if pilot light goes out, or if it burns too low to insure perfect ignition. A draft diverter protects against any possible down drafts through the chimney. Automatic Gas Equipment Co., 301 Brushton Ave., Pittsburgh 21.

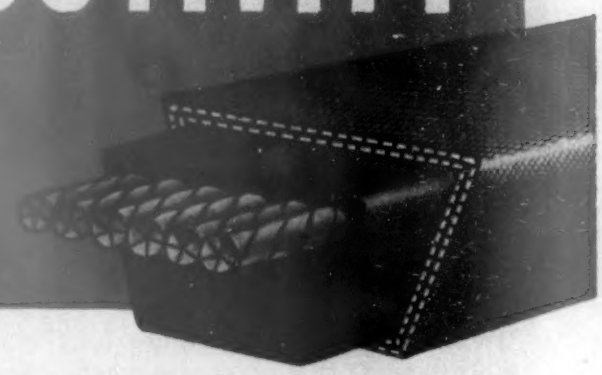
Rotary Hand Pumps

Three models of crank-operated barrel hand pumps are of 10-g.p.m. capacity. One type is equipped with a 1½-in.-dia. drip pan cast integrally with the bung attachment. Fins in the drip pan support oilcans or other



BULL DOG V-BELTS

HELP THE MANUFACTURING INDUSTRY BUILD GREATER PRODUCTIVITY



In the present postwar rush for greater production, there's a noticeable trend toward bigger machines with higher operating speeds. Thus more work is turned out, and V-Belts have to carry heavier loads and stand more punishment.

Bull Dog V-Belts are designed to meet these present day conditions. They're entirely new — not a rehash of old construction, but a brand new product developed in BWH laboratories to do your job better, for a longer time, at lower cost. Test runs in leading industries prove that Bull Dog V-Belts more than measure up to laboratory predictions of amazingly increased efficiency.

In the short time they've been on the market, Bull Dog V-Belts have won phenomenal acceptance. Here's why:

EXCLUSIVE BWH Bull Dog Cords have greater tensile strength.

EXCLUSIVE BWH Compounds run cool, don't crack, or deteriorate under severe flexing.

EXCLUSIVE BWH Covers of heavy, bias-cut material resist wear, protect against dirt, grease, moisture.

Specify Bull Dog V-Belts on your next installation. You'll be glad you did, when you see maintenance cost sheets and production records!

HAVE YOU A JOB WHERE STAMINA COUNTS? Bring us your toughest problems. We're specialists in solving them. For all industrial rubber needs, look to BWH products for dependable ruggedness, BWH distributors for dependable service.

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

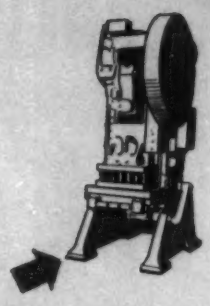
Distributors in all principal cities

PLANT: CAMBRIDGE, MASS., U. S. A. • P. O. BOX 1071, BOSTON 3, MASS.

MODERN BASE FOR MACHINES!

MB's ISOMODE* PAD helps you

CUT OPERATING COSTS!



1. *Works under present feet of machines*
2. *Eliminates special foundations and anchoring*
3. *Cuts down vibration and noise*
4. *Reduces maintenance*

It's the vibration of machines (or their impact) that creates so much extra expense in a plant. So often it's the cause of damaged plaster and floors. You'll find it responsible for rapid loosening of machines, interference with precision work, nerve-wracking noise level even in offices far removed from the factory floor. And all so needless now! For you can take the wear and tear out of vibration easily, quickly, cheaply — with Isomode Pads!

See that cross-cleated construction? It was engineered that way for the special resiliency required to cushion impact and vibration *effectively*. Though only 5/16" thick, Isomode Pads are all you need to anchor your lightest machines, your heaviest ones. No expensive built-up bases, no bolting to floors, no costly job when it comes to relocating equipment! A heavier machine simply gets supported by a larger area of pads.

Molded of Neoprene, Isomode Pads resist oil, water. Place them under your machines and forget them for years. They are supplied in sheets 18 x 18 inches square to be cut to necessary size by your maintenance crew. Each pad is enough for a total of 9½ tons of machines!

IN THOUSANDS OF INSTALLATIONS, Isomode Pads are now cutting plant costs and improving working conditions for satisfied users. Why not learn what they can do for *you?*

SEND FOR THIS DETAILED BULLETIN

It tells you about more benefits, and shows how easy it is to install Isomode Pads.

*Trade Mark Reg. U. S. Pat. Off.

THE MB MANUFACTURING COMPANY, INC.
1080 State Street, New Haven 11, Conn.

containers. A brass screen excludes foreign matter from the overflow which runs back into the barrel. Suction pipe, ¾x40 inches, is beveled on lower end. Another type is the same as the first, except that a meter with 4½-in., 8-gal. dial is mounted between the pump and the spout. The meter measures the quantity pumped, and has a totalizer reading to 9000 gallons. The third is the same as the second, except that it has a deflector which prevents water or dirt from entering the barrel. Bung attachment for either 1½-, or 2-in. I.P. openings is included. Industrial Pump Div., Bowser, Inc., Fort Wayne, Ind.

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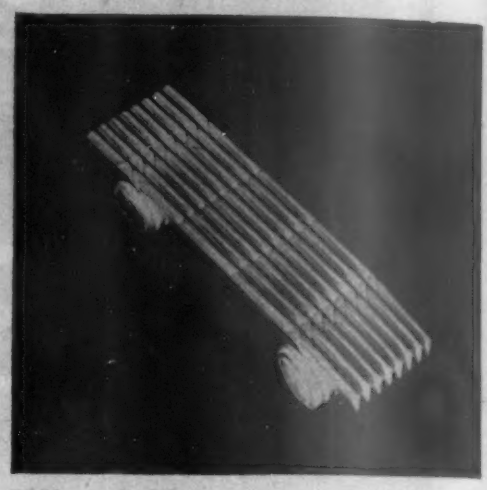

Wire Screens

Screens, suitable for washing, dewatering, classifying, or similar work, are made of wedge-shaped wires, formed into loops at regular intervals. The desired number of wedge wires are fastened together with cross rods, riveted or welded at the ends to produce rigidity. Longitudinal rigidity is obtained from the strength of the wedge wire itself. These screens, called Cambri-Wedge, can be fabricated in any length or width required, and from a wide range of metals or alloys including stainless steel. Cambridge Wire Cloth Co., Cambridge, Md.

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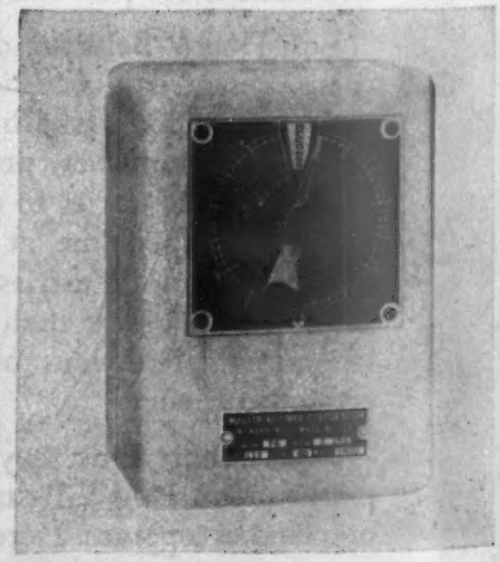


Timers

Series PAC timers, ranging from the 5S, 5 cycles to 5 seconds, calibrated in 5-cycle steps, to the 3H, 2 minutes to 3 hours, calibrated in 2-min. steps. Timers are designed for use in process control, automatic conveyors, grinders, quenching equipment, packaging machinery, spotwelders,

CUT COSTS

NORTON PRODUCTS

ABRASIVES

Alundum and Crystolon abrasives for polishing, lapping, tumbling and pressure blasting.

GRINDING WHEELS

Grinding wheels ranging from tiny mounted points to gigantic ten ton pulpstones—wheels for every type of grinding job.

GRINDING AND LAPPING MACHINES

A varied line of machines for production-precision grinding and lapping and for the tool room.

NORBIDE (Norton Boron Carbide)

The hardest material made by man—available as an abrasive; in molded products for extreme resistance to wear; and for metallurgical use.

REFRACTORIES

High temperature refractories for metal melting, heat treating and enameling; for boiler furnaces; for chemical processes.

SHARPENING STONES

Manufactured and natural stones in sizes and shapes to meet every sharpening and production need.

ABRASIVE PAPER AND CLOTH*

Abrasive paper and cloth in sheets, discs, rolls and belts in a variety of coatings for every industrial need and for the home.

*Products of Norton Behr-Manning Division

NORTON COMPANY, WORCESTER 6, MASS.

Save on heavy-duty cleaning!

Read how the new General Electric Commercial Vacuum Cleaner cuts costs two ways!

1—You can save the surfaces of your floors, rugs, and linoleum with the *new* General Electric Commercial-Industrial Vacuum Cleaner!

The fast, efficient action of G.E.'s new cleaner removes dirt and dust *completely* —gets it so clean you add *years* of life to all surfaces!

2—It's built to last! General Electric's Commercial Vacuum Cleaner will stay on the job a long, long time!

Easily operated by one man with no previous experience. This versatile machine has attachments for every purpose. Quickly cleans draperies, upholstery and furniture. Models available for wet and dry pickup.

Each machine is backed by the General Electric Company warranty.

For further details, mail coupon below. General Electric Company, Bridgeport 2, Connecticut.

FAST • EFFICIENT • QUIET • ECONOMICAL

The New General Electric

Commercial Vacuum Cleaner

GENERAL ELECTRIC

Appliance & Merchandise Department, Section 155
General Electric Company, Bridgeport 2, Conn.

Send descriptive literature concerning
( ) Wet and Dry Pickup Vacuum Cleaner
( ) Dry Pickup Vacuum Cleaner

NAME.....

FIRM.....

ADDRESS.....

CITY..... STATE.....

vacuum tube devices, and other equipment. Manufacturer states that as soon as the clutch is disengaged, an internal spiral spring brings the actuating arm back to its reset position. Time setting adjustment is accomplished by moving a button pointer to the time cycle required. Industrial Timer Corp., 115 Edison Pl., Newark, N. J.

•

Salt Tablet Dispenser

Made of sunfast blue molded plastic, salt tablet dispenser holds either 9- or 10-grain tablets. A transparent window shows the supply inside, and the dispensing knob at the bottom works either right or left to dispense one tablet at a time. Dustproof top unscrews for refilling. Installation assembly includes bracket for mounting on flat surface and a clip that prevents the dispenser from being jolted loose. Front of the dispenser carries directions explaining use of salt to prevent heat cramps and muscular exhaustion. International Salt Co., Inc., Scranton, Pa.

•

Power Wheelbarrow

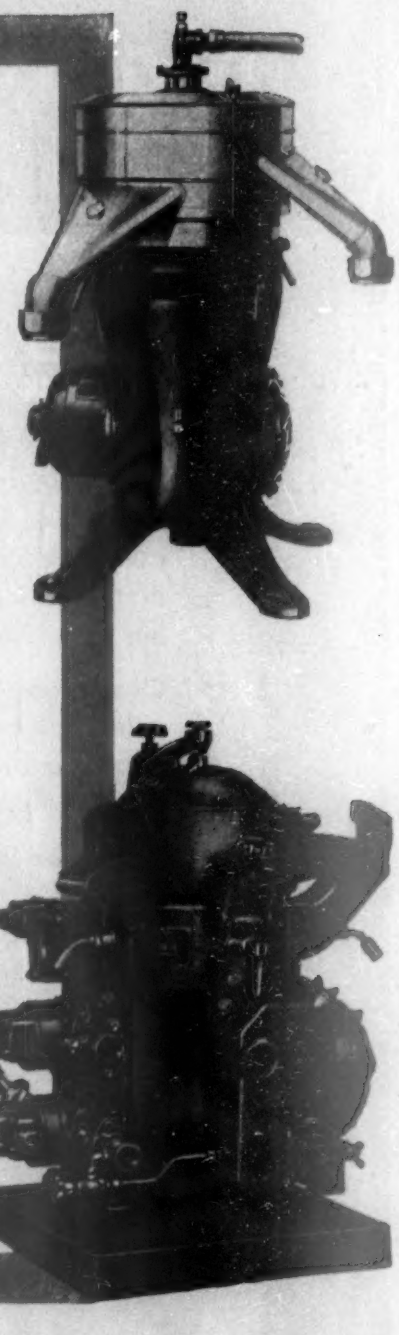
Powered through V-belt drive and enclosed gears from an air-cooled 3.9-hp. gasoline engine, power wheelbarrow, called the Moto-Bug, has a rated capacity of 10 cubic feet, or approximately 1000 pounds. It is equipped with fingertip control of speeds from 2 to 4 m.p.h., both forward and reverse. Features include an instantaneous gravity dump body with chain stop, a steering device that turns the machine in its own length, a differential on the front axle. Its maximum width is 33 inch-

With my help LESS OIL *does* MORE WORK

"I am De Laval Centrifugal Force. In plants of all types I do two basic jobs best: (1) I remove contaminants from oil or other liquid and (2) I separate two liquids which are of different specific gravities. By continuously removing both solid and liquid impurities at a constant rate of efficiency, I save time and conserve the product, too.

"In metal-working plants, the greatest opportunity for me to work is in maintaining various cutting oils and coolants in such perfect condition that they are always safe for re-use. Here, the problem usually is one of removing small metallic or abrasive particles from oil. In some cases, the need is to remove water from certain oils or compounds, such as in dehydrating slushing compounds.

"In other words, De Laval Centrifugal Force enables oil to be used longer. To put it another way, De Laval centrifugal machines enable *less* oil to do *more* work."

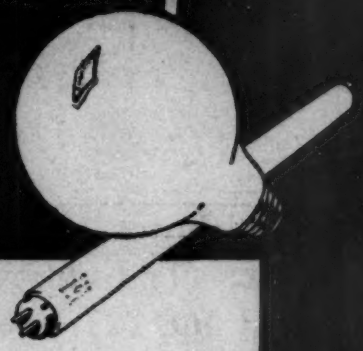


De Laval

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

Industrial Separators and Oil Purifiers

It's a good plan for you to put these three planks in your planned lighting platform



1. Champion Fluorescent and Incandescent Lamp Quality. When you standardize on lamps bearing the Champion diamond mark you can be certain of the best light for your money. Champion Lamps are guaranteed to equal or exceed Federal Specifications — backed by one of the oldest and largest manufacturers in the business.

2. Champion Industrial Lighting Service — trained experts in the field to give you unbiased recommendations on lighting and lamp applications to meet your individual requirements.

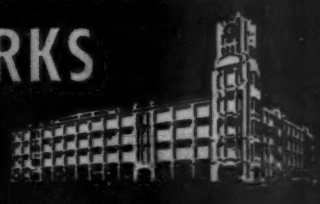
3. Champion Industrial Distribution—Champion Lamps are available in your locality through electrical or industrial supply houses that know your needs and are qualified to give you prompt, intelligent, low cost service. There's no better, more efficient or more economical way to buy lamps.

Let us mail you a copy of the Champion Maintenance Manual "C" It's full of useful hints on how to make the most of *planned lighting.*

CHAMPION LAMP WORKS

Lynn, Massachusetts

A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.



es, and it is mounted on two rubber-tired wheels with a single rubber-tired steering wheel. Kwik-Mix, Subsidiary of Koehring Co., Port Washington, Wis.

•

Floor Maintenance Machines

Two models of floor scrubbing, polishing, and waxing machines, called Floorsavers, Models S and T, are equipped with ¾-hp. single-phase motor with glass-insulated windings. Machines have ball-bearing, grease-sealed gear trains, and 16-in. brushes with various types of bristles in either wood or refillable metal backs. Trigger *on-off* switch is located on the adjustable handle. Model T is equipped with a 3½-gal. aluminum solution tank and automatic or manually controlled feed to the brush. The Ace Co., 12-40 North Orange St., Ocala, Fla.

•

Scaffolding

Made of tubular steel, with all joints electrically welded, adjustable work platform is suitable for off-the-ground jobs, inside or out. Basic individual parts can be assembled into complete rigid units of any desired height. Diagonal braces, braced pedestals, and connecting lengths are all adjustable for different assemblies, and tiers for masons, painters, plasterers, and maintenance men come in different styles and sizes. Ball-bearing casters allow the as-

Kodak

To open minds to your message

. . . use films

Ever see workers so attentive, so absorbed . . .?

This is the attitude that motion-pictures generate . . . the receptiveness that opens minds to any message you may want to put across.

If your message is to trainees, films enable you to endow training fundamentals with a clarity and simplicity that make them easy to understand.

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If your message is to the community, films enable you to build acceptance for plant and products . . . to tell your story in a way that cannot fail to capture interest and good will.

These and many other things you can do with photography because it opens minds to your message . . . because of its other unique characteristics. For an introduction to some more of its functional applications in industry and science, write for "Functional Photography."

EASTMAN KODAK COMPANY
Rochester 4, N. Y.

Advancing industrial technics . . .

Functional Photography

PRODUCTION MACHINERY..

Part of a "loop" of Logan Roller Conveyor which serves a series of operations in the making of automobile tires. In this view tire molds are moved by conveyor to and from heater stations alongside the conveyor run. Hoists handle molds into heaters and return to conveyor.

..*not* just auxiliary equipment

TO LIFT production well above the level of "average" efficiency, more and more modern industrial plants are recognizing Logan Conveyors as an integral part of production equipment.

For Logan Conveyors enable materials and subassemblies to reach work stations on schedule . . . and to move to successive operations with proper timing . . . all at convenient working heights. In this way conveyors have proved themselves to be "part of the process."

It is probable that your plant output can be stepped up at one or more stages with well-planned conveying equipment. Literature sent on request.

SINCE Logan 1876

Logan Conveyors

LOGAN CO., INC., 510 CABEL ST., LOUISVILLE 6, KY.

sembled units to be moved about, and the various parts of the assemblies are put together with adjusting handscrews and tubular inserts. Bil-Jax, Inc., Archbold, Ohio.

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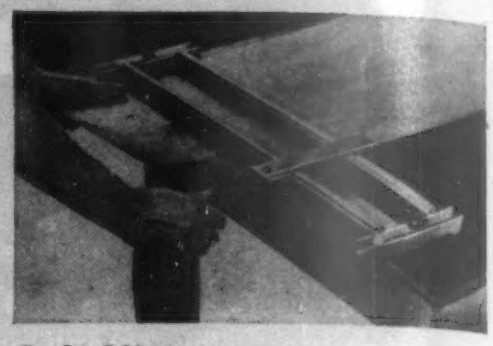

Belt Slitter

Designed to slit belting lengthwise at any desired width, device is attached to the end of a bench or table, locked in position, and the belt is pulled through by hand. The cutting edge is a standard razor blade, reinforced by a holder from which it can be removed and replaced. Hold-down rollers keep the belt from buckling, and an adjustable guide assures uniform widths. Standard size will slit belting up to 24 inches wide and ⅜ inch thick. Other sizes can be made to order. Beltuf Belting Co., 3773 Las Flores Court, Los Angeles 34.

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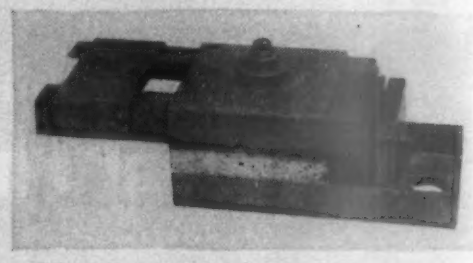

Isolated Mounting Rails

Separate base construction of the Duplex Twin rail base, achieved by use of resilient "Adjusto-Chocks" which maintain alignment, is said to permit selection of drive-center distance, motor position, fan rotation, or hold-down bolt location right on the job site. Both adjustability and rigidity are thus obtained. The Korfund Co., Inc., 48-25 32nd Pl., Long Island City 1, N. Y.

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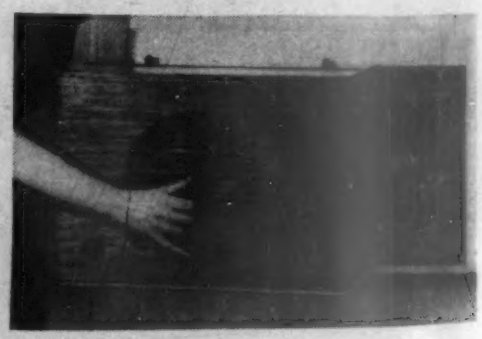


Air Circulator

Portable window-type air circulator, called the Health Trola, is made of metal, bonderized against rust. It operates from standard a.c. circuits and has movable side extensions to fit it into windows of most sizes. Use of this unit provides both ventilation and circulation without opening windows. Large filter screens out pollen, dust, smoke. A special unit

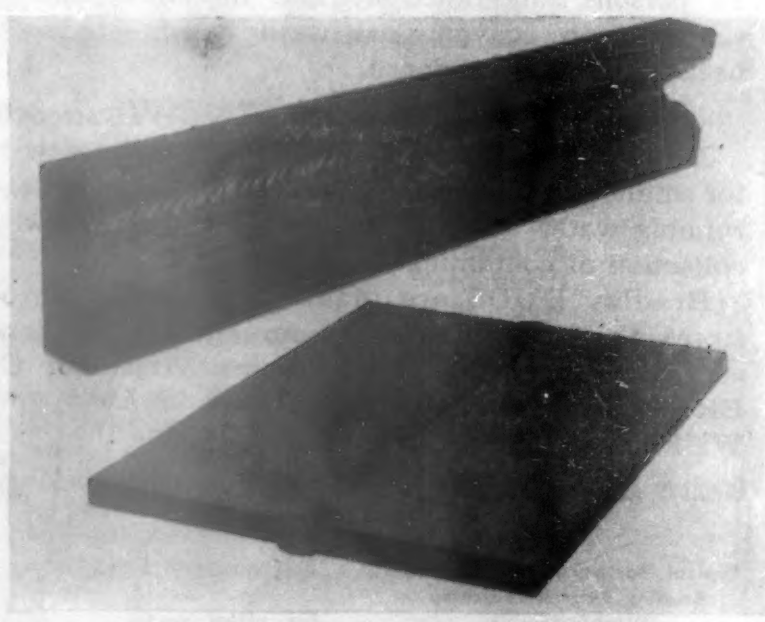
New Electrode Solves Many Welding Problems

Lincoln "Shield-Arc LH-70," for mild steel and hard-to-weld steels, operates in all positions, a.c. or d.c.

EASILY MACHINED. This manufacturer of tire molds, made of high-sulphur (free machining) steel, has simplified repair work with "Shield-Arc LH-70" because its deposits are easily machined and dense. Ribs in mold shown are being built up along edges due to machining error. Welded ribs will then be machined to proper size.

BANISHES POROSITY. In fabricating sprockets, this manufacturer welds together a disc of mild steel plate and a hub of round cold-rolled stock as shown. Formerly welds were porous; with "Shield-Arc LH-70," they are dense and smooth.

ELIMINATES HEAT-TREATMENT. In the welding of high-carbon, thin-walled tubing, this Company had to use costly heat-treating. This has been eliminated by welding with "Shield-Arc LH-70." Similar benefits are being obtained for high-tensile steels and welds to be porcelain enameled without annealing.



EASY . . . FAST. Many shops are using "Shield-Arc LH-70" for mild steel. On bevelled horizontal butt joints (above), it eliminates need for or materially reduces back-chipping and it can be used with easy straight-drag technique—no whipping required. On down-hand square butts (below), "LH-70" gives 15% to 20% faster welding because of ability to use higher current and get deeper penetration.

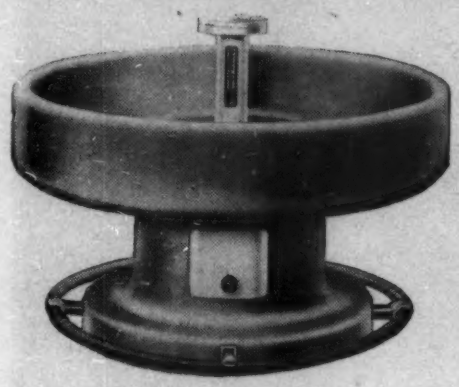
The above is published by LINCOLN ELECTRIC in the interests of progress. For further information on "Shield-Arc LH-70," write The Lincoln Electric Company, Dept. 183, Cleveland 1, Ohio.

Advertisement

SAFEGUARD EMPLOYEES' HEALTH WITH SANITARY WASH-FIXTURES

Described as the "closest thing to a germproof building" the new Laboratory at_____has *every sanitary safeguard* such as:

"The sinks have no handles to be contaminated by busy hands; faucets are operated by . . . foot pedals".



THE 54" BRADLEY WASHFOUNTAIN

Bradley's Have No Faucets to Touch

THE DUO

Bradley Washfountains, used for more than a quarter century, provide faucetless foot-operated wash fixtures. Hands need touch nothing but the cleansing spray of running water that comes from the central sprayhead . . . The 54-inch Bradley serves 8 to 10 persons simultaneously and therefore replaces that many single-person conventional wash basins,—reduces piping connections and maintenance.

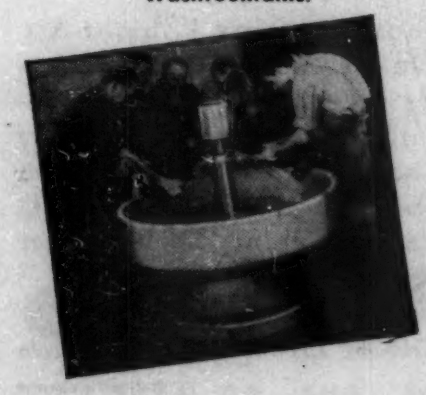
One DUO Replaces Two Wash Basins

In the new Bradley (2-person) DUO, you now have available for smaller washrooms—the same sanitary features—foot-control, running water for two persons, self-flushing bowl that prevents collection of contaminating water in the bowl.

Bradley DUOS are ideal for public washrooms and for stores, theatres, office washrooms, railroad stations, schools, institutions, hospitals, laboratories. Write for Catalog 4701. BRADLEY WASHFOUNTAIN CO., 2215 W. Michigan Street, Milwaukee 1, Wis.

Bradleys Are Distributed Through Plumbing Wholesalers.

Typical factory installation of Bradley 54-inch full-circle Washfountains.



For office washrooms, the Bradley DUO serves with convenience and sanitation.

BRADLEY *washfountains*

absorbs odors. Air is circulated by a built-in 10-in. pressure-type silent fan. Deflector sends the current of air angled to any direction. Health Trola Div., Excel Heating & Air Conditioning Co., 3715 Belmont Ave., Chicago 18.

•

Pulley Lagging

All-purpose waterproof lagging that can be applied without rivets, bolts, or heat, dries within 10 hours at room temperature. Manufacturer claims that it adheres so firmly to all surfaces that a hammer and chisel are needed to remove it. Said to be weather and corrosion resistant, unaffected by sulphuric acid, oxidizing agents, soaps, alcohol, and petroleum products. When dry it is odorless, non-toxic, and non-flammable. It provides a frictional surface which eliminates belt slipping. It is suitable for crown, split, and flat pulleys, for use with leather, cord, wire-woven, or rubber belts. Consists of a mineral-base fabric and a waterproof compound, and may be ordered in units of 70x40-in. fabric, cut to size for any specified pulley measurements, or in rolls of any width up to 42 inches. Condersite Engineering Corp., 2015 Chancellor St., Philadelphia 3.

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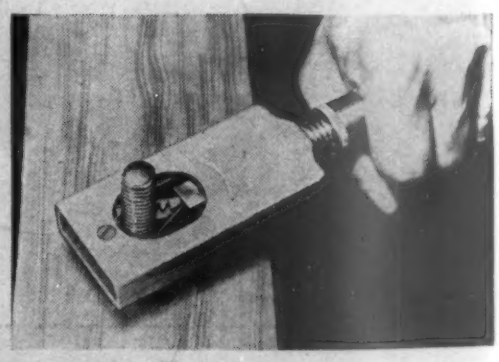
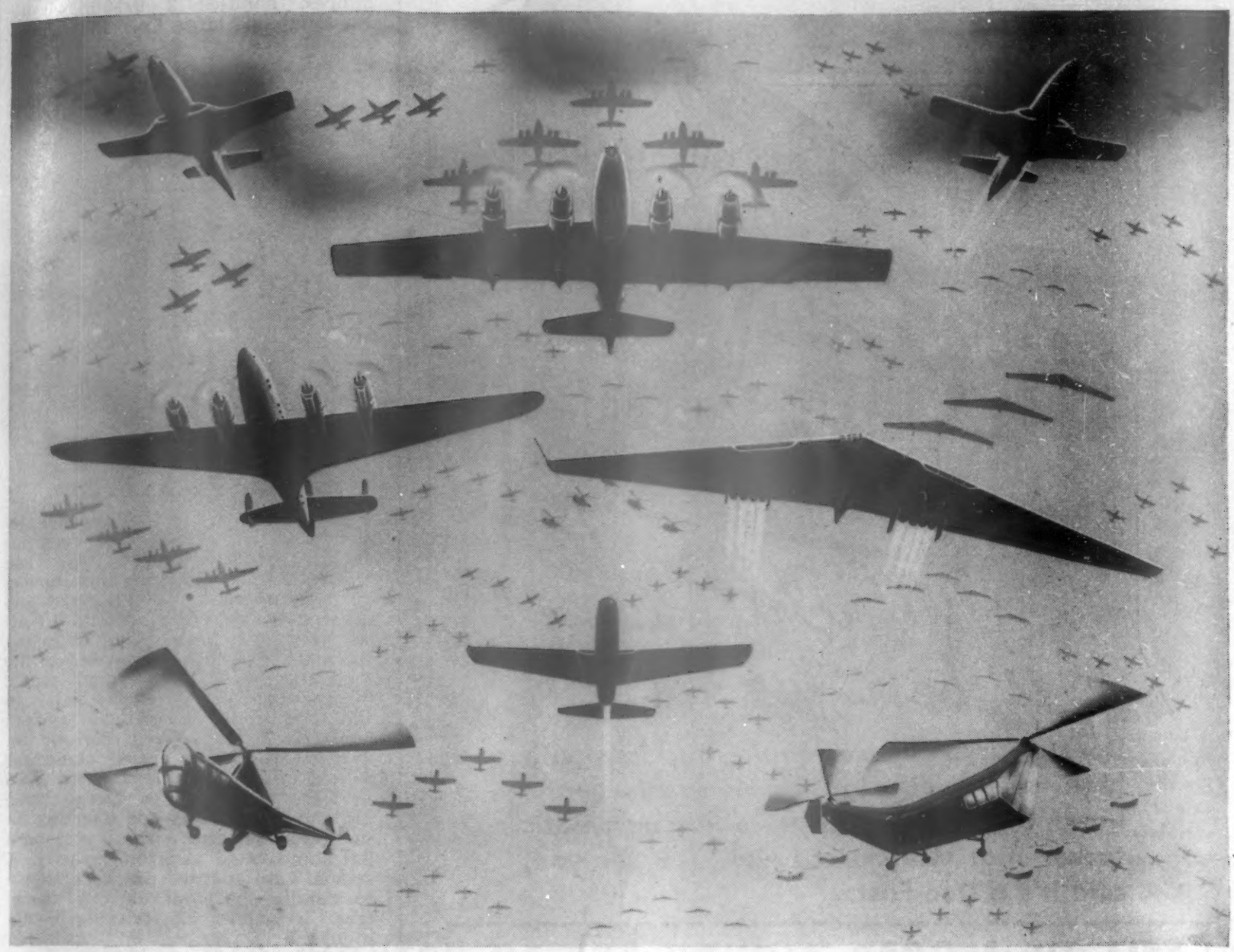


Thread Cleaner

Tool designed to clean and restore flattened, distorted, or badly rusted right- or left-hand threads is suitable for use on bolts or studs up to 2 9/16 inches in diameter. It may be used on any size or pitch or any type of bolt, and leaves them clean so that nuts that may have been difficult to dislodge may be removed with ease. To operate, the device is slipped over the bolt, the cutting jaws are tightened into the threads close to the nut. Threader is turned until it comes off the end of the bolt. The threader is set and held to size by a single locknut on the knurled handle. Made in two sizes; No. 6103, 15 ounces, is for bolts of 1 inch in diameter; No. 6104, 2 pounds, 4



ON AMERICA'S AIR FLEET

Foote Bros. Power Units and Actuators

Modern aircraft operation demands a high degree of automatic control to free pilots from tasks that mechanical units can perform better.

Because of the pioneering done by Foote Bros. in the production of aircraft devices—because of the ability of Foote Bros. engineers to solve problems faced in designing gear units of minimum weight to fit in a confined space—because of the complete facilities, modern techniques, and wide experience found in Foote Bros. large plants—actuators and power units produced by Foote Bros. are serving on many of the leading airplanes that form America's air fleet.

A-Q (aircraft quality) Gears that contribute so much to the efficiency of these units are also employed on turbo-jet engines and on such reciprocating engines as the Wasp Major.

The ability of Foote Bros. to serve the highly specialized demands of the aircraft industry is a good testimonial to the ability of Foote Bros. engineers to provide you with better gears, power units, and enclosed gear drives to meet even the most exacting specifications.

Whatever your requirements, call Foote Bros.

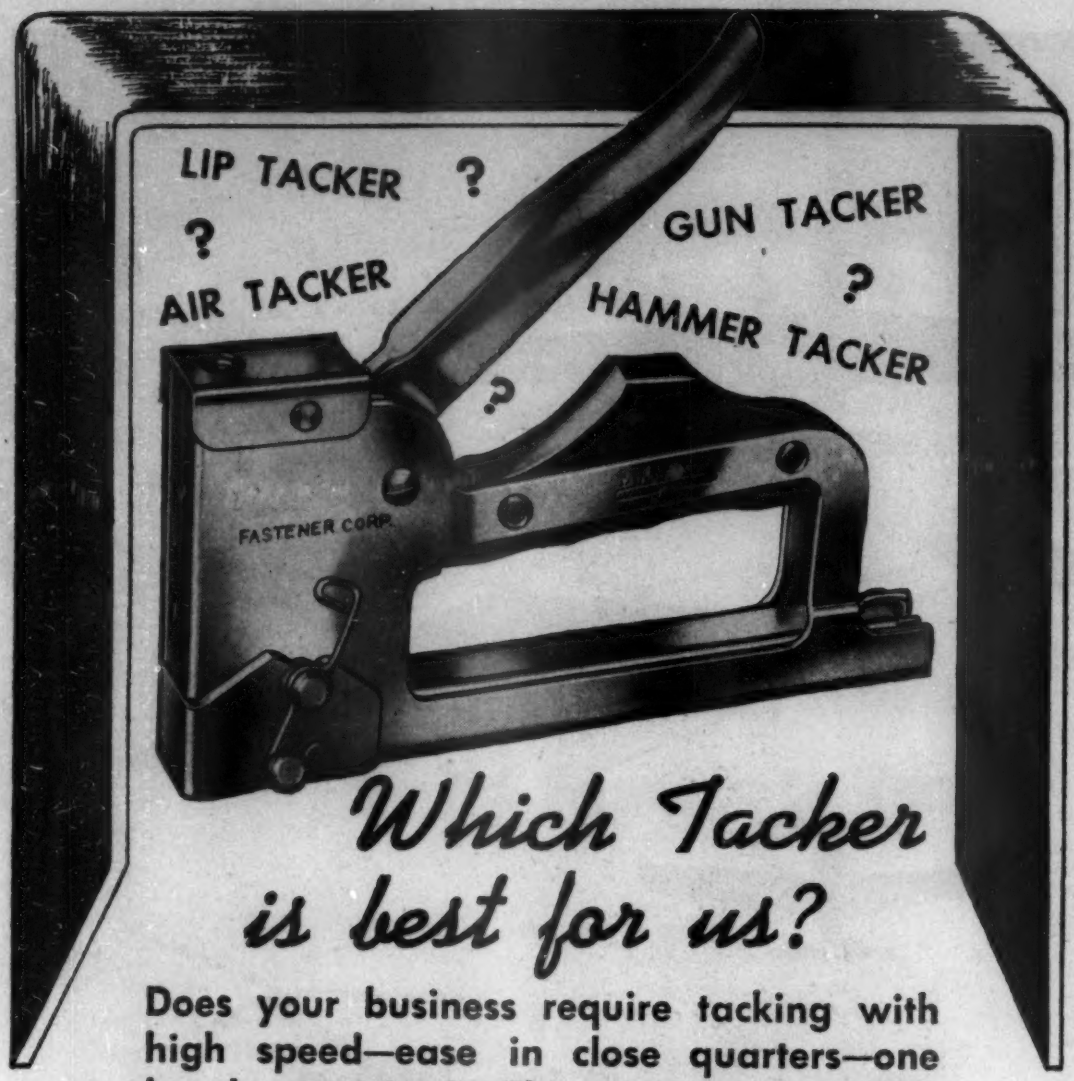
FOOTE BROS. GEAR AND MACHINE CORPORATION
Dept. I, 4545 S. Western Blvd. • Chicago 9, Illinois

Accessory Drive on Turbo Jet Engine

Precision Gears on Pratt and Whitney Wasp Major

FOOTE BROS.

Better Power Transmission Through Better Gears



Which Tacker is best for us?

Does your business require tacking with high speed—ease in close quarters—one hand operation? There is an automatic tacker that will do a "real" job for you, and it's a Duo-Fast.

TELL US MORE

about the Duo-Fast Tackers that do a real production job. Show us what Duo-Fast Tackers can do.

OUR BUSINESS IS _____

COMPANY NAME _____

ADDRESS _____

CITY _____ **STATE** _____

DUO-FAST FASTENER CORPORATION
887 Fletcher Street Chicago 14, Illinois

HAMMER GUN AND AIR TACKERS AND STAPLES FOR REDUCED PRODUCTION COSTS

DUO FAST

ounces, handles 2 9/16-in. bolts. Buckingham Mfg. Co., Inc., Binghamton, N. Y.

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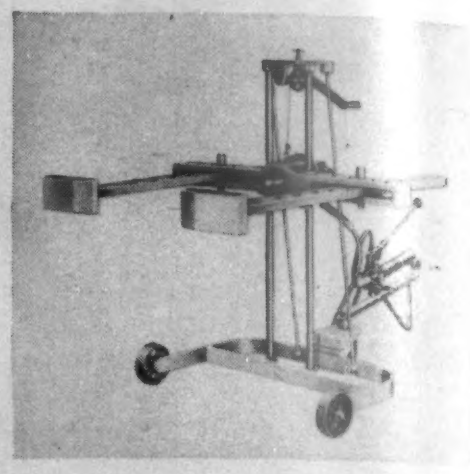

Hydraulic Pulley Puller

Designed for use in maintenance departments and electric motor service shops, hydraulic pulley puller can be handled by one man. Can remove rusted, fast-stuck pulleys, gears, and other objects from a shaft in a matter of minutes, according to manufacturer. Pressure is supplied to the hydraulic jack by a hand pump. Three adjustments set the puller to the required dimensions. Beams, arms, jack, and pump can be removed from the puller stand for overhead or other special uses. Two models available, a large size, mounted on wheels and exerting 20-ton pressure, and a small size on a flat stand rated at 5-ton capacity. A special ram adapter can be obtained to handle shafts of various diameters. Industrial Engineering Equipment Co., Davenport 2, Iowa.

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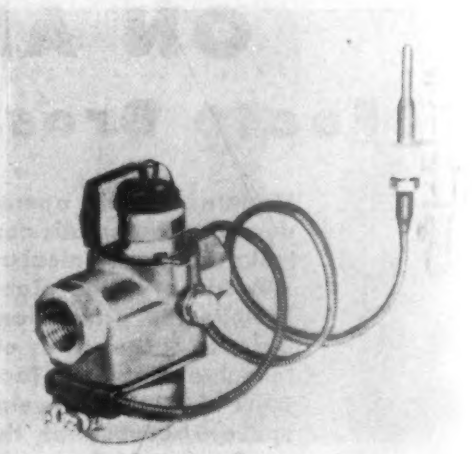


Gas Cock Control Unit

On-off and safety shutoff control unit, MR-2-4, designed for floor, central, small space, and water heaters, automatically stops flow of gas when the pilot is extinguished. During the reset operation, gas flows to the pilot burner only. Not until the pilot is ignited and the safety valve set in the operating position will gas pass to the main burner. Single handle control can be set for any desired flow to the main burner without moving the gas cock from closed position. Safety valve operating mechanism is sealed against airborne or gasborne foreign matter or scum-forming vapors, and double-sealed against gas leakage to the atmosphere. Choice of attached or rod-

A Distributor serves you Best

TONKA WATER HOSE—braided construction. It is high quality for general service...lightweight, flexible, easy to handle, will not kink. Constructed with two or three braids of cotton reinforcement . . . has good quality tube and wear-resisting cover.

YOUR DISTRIBUTOR OFFERS DOUBLE RESPONSIBILITY FOR PRODUCT SATISFACTION

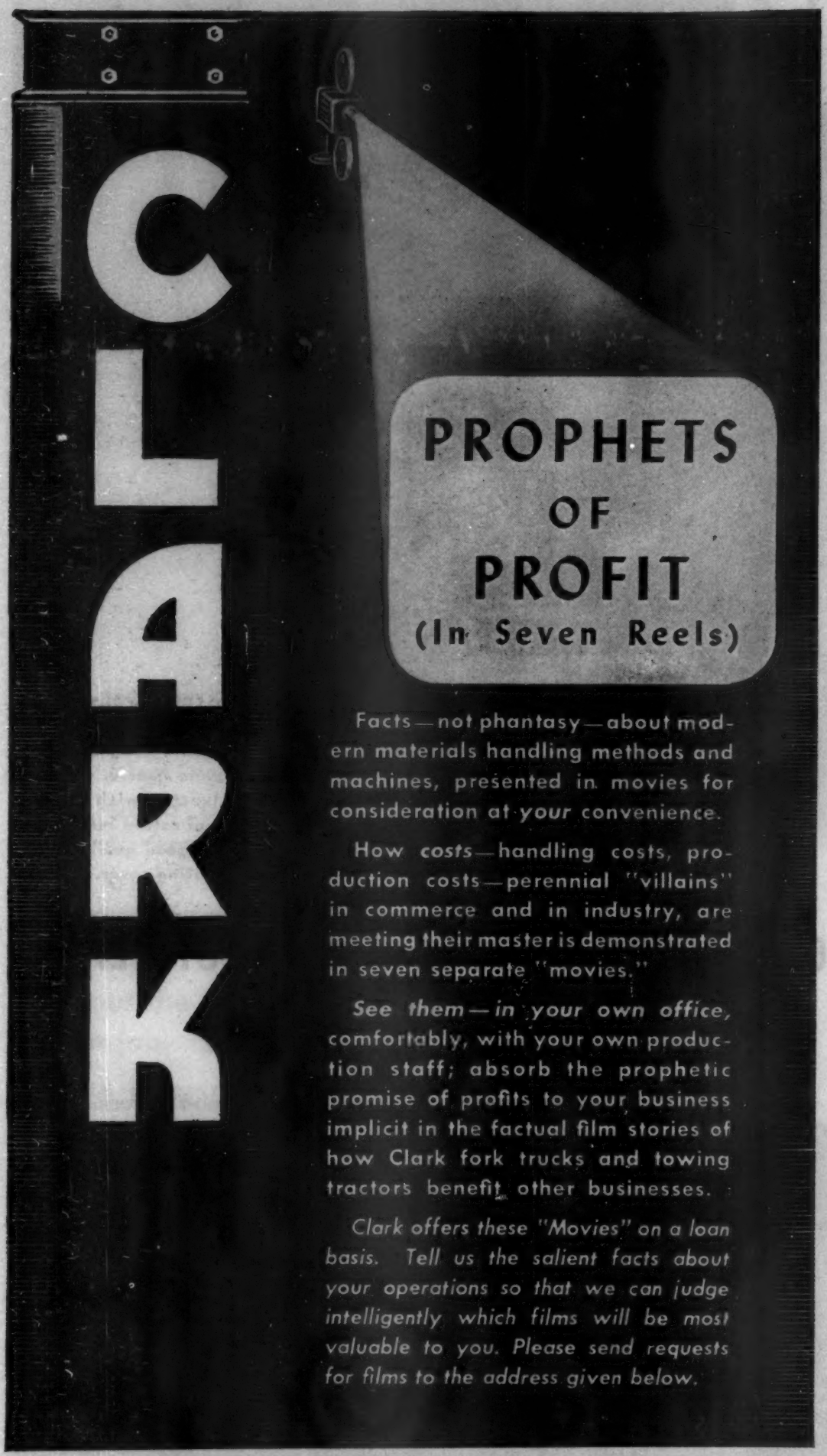
Your distributor is responsible for the good performance of the products he sells you . . . SO IS THE MANUFACTURER.

This double responsibility places purchasers in a safe and advantageous position, providing the policy of both the source of supply and the source of outlet is clearly understood. Republic Rubber's distributors are chosen for "Policy" and distributors choose Republic because of Republic's 5-Point Sales Policy. Such a combination is truly "double responsibility."

MECHANICAL RUBBER GOODS BY

REPUBLIC RUBBER DIVISION

REPUBLIC RUBBER DIVISION
LEE RUBBER & TIRE CORPORATION . . . YOUNGSTOWN, OHIO
Lee Deluxe Tires & Tubes, Conshohocken, Pa.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(In Seven Reels)
Facts—not phantasy—about modern materials handling methods and machines, presented in movies for consideration at *your* convenience.
How *costs*—handling costs, production costs—perennial "villains" in commerce and in industry, are meeting their master is demonstrated in seven separate "movies."
See them—in your own office, comfortably, with your own production staff; absorb the prophetic promise of profits to your business implicit in the factual film stories of how Clark fork trucks and towing tractors benefit other businesses.
Clark offers these "Movies" on a loan basis. Tell us the salient facts about your operations so that we can judge intelligently which films will be most valuable to you. Please send requests for films to the address given below.
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TOWING TRACTORS
INDUSTRIAL TRUCK DIV., CLARK EQUIPMENT COMPANY BATTLE CREEK 12, MICH.
REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

The National Guard Defends America — Join Now

drive-type handle. Suitable for natural, manufactured, mixed, and liquefied petroleum gases. General Controls Co., 801 Allen Ave., Glendale 1, Calif.

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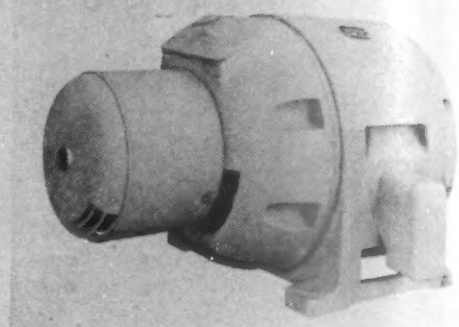

High-Speed Synchronous Motors, Generators

Line of general purpose "Tri-Clad" high-speed drip-proof synchronous motors, 900 series frame sizes, are available in standard ratings from 20 to 1000 horsepower at 60 cycle speeds of 514 to 1800 r.p.m., in either 2- or 3-phase types. Generators, also 900 series frame sizes, come in ratings from 12½ to 1250 kva. Direct-connected and belt-driven exciters may be obtained for all ratings. General Electric Co., Large Motors & Generators Div., Schenectady 5.

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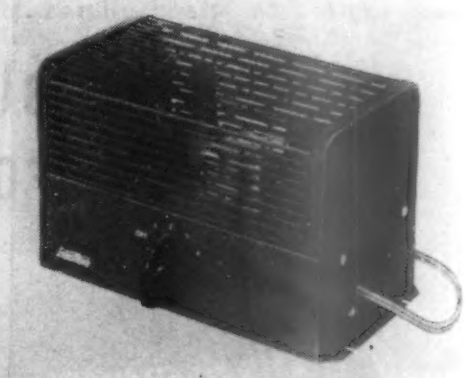


Amplifier

Booster amplifier, Model P-29, for use with manufacturer's intercommunication and sound systems, provides increased paging volume on systems designed to call all stations simultaneously. When used with an existing system, audibility of staff stations and reproducers located in noisy places is substantially increased. When coupled with a standard reply station, it provides audible two-way intercommunication. Operates on 110-120 volts, a.c. or d.c.; yields an output of 8 watts and consumes a maximum of 53 watts. Size is 5¼x4½x8 3/16 inches. Combination four-step volume control and *on-off* switch regulates volume. Executone, Inc., 415 Lexington Ave., New York 17.

•

Glass Heating Plates

Tempered glass plates which produce infra-red rays, suitable for all types of work requiring even, controlled heat, feature a metallic com-

ANOTHER Good Reason
for using Square D Control

New "OFF-THE-SHELF" Parts Kits make normal maintenance easier than ever!

All motor starters and contactors are subject to periodic contact replacement under conditions of heavy load or frequent operation. That's why Square D has always stressed accessibility of these parts. Now, the parts themselves are packaged in easy-to-stock kits to make that replacement job even more simple.

Each kit contains all parts necessary to replace load contacts on two or three-pole contactors and starters. Parts are individually packaged in clearly labeled envelopes. An illustrated service bulletin is enclosed to provide quick parts identification and complete installation instructions.

Six different Class 9998 Parts Kits are available for servicing Sizes 0 and 1 manual starters and Sizes 00, 0, 1 and II magnetic starters and contactors.

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D CANADA, LTD., TORONTO, ONTARIO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

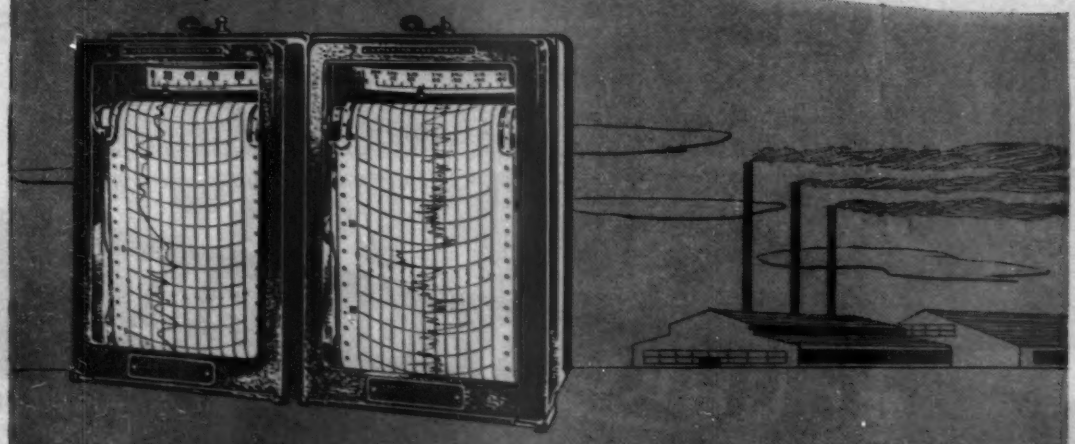
9 out of 10 industries Need Bendix-Friez Wind Recorders for Smoke Abatement Installations

Equipment for smoke and fume control is not complete without permanent records of wind-speed and direction. Write us about Aerovane.*

*TRADE MARK

Aerodynamic transmitter is easy to install and modern in design.

Wind speed, wind direction permanently recorded indoors.



FRIEZ INSTRUMENT DIVISION
OF BENDIX AVIATION CORPORATION
Baltimore 4, Maryland

PRODUCT OF Bendix AVIATION CORPORATION

pound applied to the rear surface of the glass in a continuous strip. Thermostatic controls maintain heating level. Available in 15x20-, 16x24-, 19x24-, or 16-48-in. sizes with pebbled surface. However, any standard glass finish or plate size can be obtained on special order. A wide range of wattage and voltage specifications also available. Oscar Fisher Co., Inc., 104 Worth St., New York 13.

•

Wiring Test Set

Wiring inspector's test set is housed in a gray fiber carrying case measuring 14 9/16x7 5/16x9⅛ inches, weighing 13 pounds. A storage compartment is provided for flexible leads and the portable meter. Power is supplied from a standard 6-volt dry cell. Manufacturer claims that its use will enable one man to make a complete test of all wiring in any building without additional help. Eastern Specialty Co., 214 South 12th St., Philadelphia 40.

•

Fork Truck

Model F50 fork truck, called Shop Mulift, has a lift of 55 inches with an over-all height of 83 inches. Rated at 20 inches from the heel of the forks, has a capacity of 5000 pounds, and a telescoping lift of 110 inches. Over-all width is 40 inches; length less forks, 85 inches; height with forks down, 83 inches; and outside turning radius, 88 inches. W. F. Hebard & Co., 336 W. 37th St., Chicago 9.

•

Aluminum "C" Clamps

Screw clamps made of aluminum alloy are non-magnetic, will not spark, corrode, or rust. Available in three models: No. 350, heavy-duty deep-throat frame, with I-beam design and double acme thread. This clamp

ALLIS-CHALMERS DRY TYPE TRANSFORMERS PUT POWER WHERE YOU NEED IT FAST!

Big Features, Big Benefits!

- Strong, safe construction. Transformer is enclosed by heavy gauge sheet steel casing with generous allowances for good ventilation . . . this affords maximum safety around unit.
- Impregnation with heat resistant varnish makes winding and insulation a solid unit. Core and coil unit is electrically and mechanically stronger.
- Lifting hooks project well out for easy hoisting.
- Generous space provided for making your connections.
- Surface finish is corrosive-resistant to acids . . . vapors . . . moisture. After it's Spra-bonderized, three coats of paint are each separately baked on.
- Standard provisions made for anchoring unit to wall or floor.

CLAMP-TYPE CONNECTORS SAVE HOOK-UP TIME, UNITS ARE LIGHTER, SMALLER . . . EASIER TO INSTALL!

TIME SAVING . . . labor *saving* solderless clamp-type connectors put your transformer on the line faster, and that means idle equipment goes back to work faster. Clamp connectors are standard on Allis-Chalmers single phase units 15 kva and larger and on three phase units 37½ kva and larger.

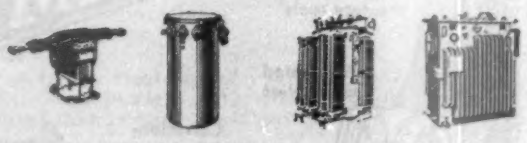
In addition, Allis-Chalmers Class B, insulated transformers are easier to install, easier to move because they are as much as 20% smaller . . . 38% lighter than conventional units using Class A insulating material. Allis-Chalmers dry-type transformers are safe and easy to maintain. Industry prefers them because they can be mounted overhead to save vital floor space. No fireproof vaults necessary . . . because a large percentage of the insulation is inorganic. No insulating liquids to test, filter or change.

There is a complete line, too . . . 14 sizes up to 500 kva . . . single or three phase. Ask your nearby A-C dealer or sales office for Bulletin B-6382, or write ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN. A 2320

A CENTURY OF SERVICE to Industry THAT MADE America Great

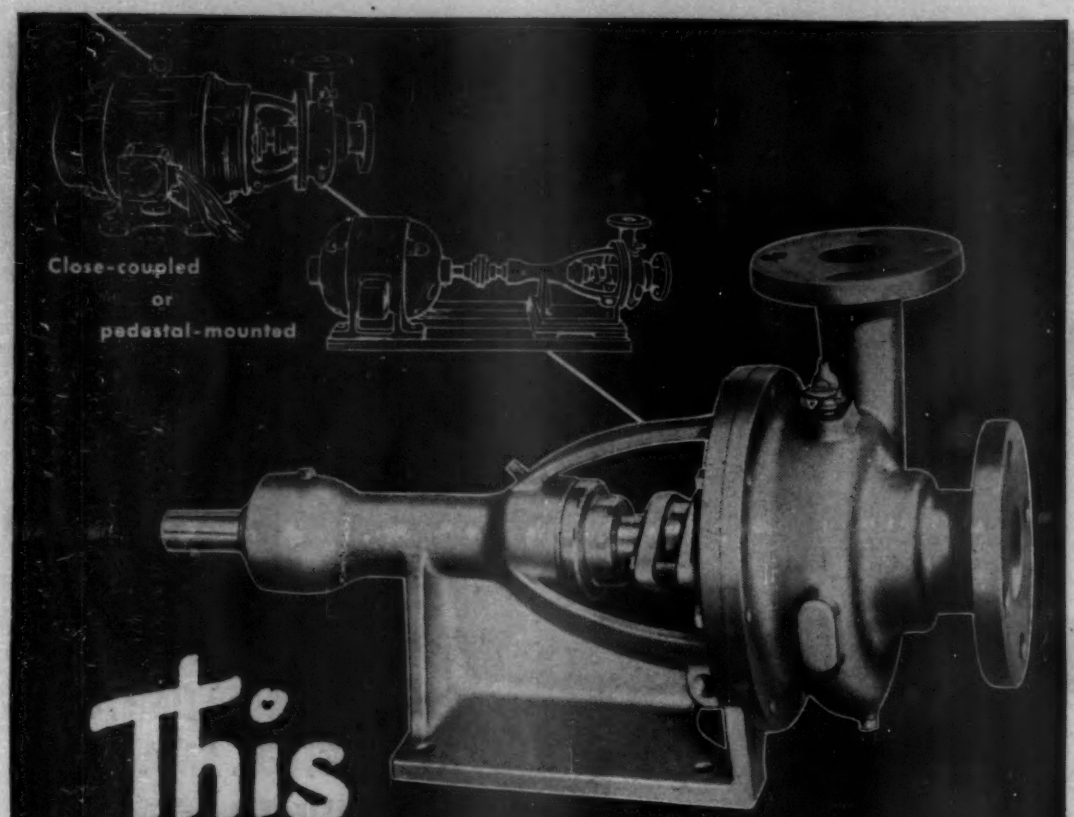
ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products



OTHER ALLIS-CHALMERS TRANSFORMERS

Instrument Transformers of all types.	Distribution Transformers 1½ to 500 kva.	Power Transformers from 500 kva to largest.	Load Center Transformers to 2000 kva.



This Ampco Pump

meets your acid test

— a corrosion-resistant pump sold as a standard model without a price premium

You don't have to pay extra for special production to get a corrosion-resistant pump. Ampco's aluminum bronze centrifugal pump is a standard model — at standard-model prices.

With this new pump, you can cut the cost of original equipment, reduce replacement frequency, and be sure of efficient handling of your corrosive and erosive thin liquids. Its corrosion-resistance prevents contamination. All passages are designed for smooth, quiet flow. Grades of aluminum bronze are varied to give maximum efficiency at each point. Operation in a 500° F ambient does not change its physical properties. It is the only bronze pump that can be welded or overlaid—Ampco-Trode 10 electrode matches the base metal perfectly.

Actual performance records prove the value of this pump in breweries, and in petroleum, chemical, and food processing industries. See your nearby Ampco engineer for full details. All sizes are available either pedestal-mounted, or close-coupled to a face-type motor. Write for bulletins.

Ampco Metal, Inc.

Dept. FM-9 • Milwaukee 4, Wisconsin

is designed for deep work requiring unusually heavy pressures, and may be obtained in sizes of 4-, 6-, 8-, and 10-in. openings; No. 325 has a sliding bar handle and comes in sizes from 3- to 12-in. work opening; No. 300 is a light-duty clamp, 2½- to 6-in. work opening. Foster Aluminum Alloy Products Corp., 114 South Salina St., Syracuse 2, N. Y.

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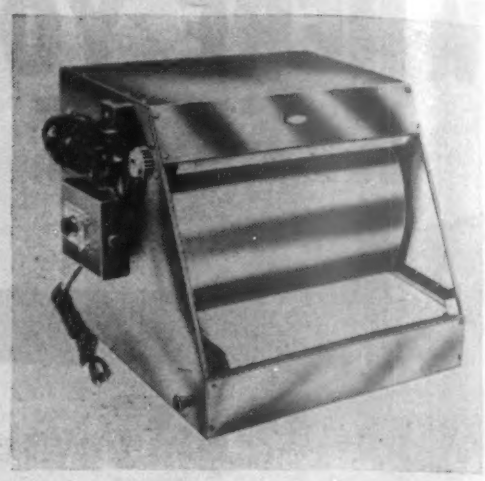


Photographic Print Drier

Electrically-driven drum drier, with variable speed drive, for photographic prints, either glossy or matte, photostats, and blueprints, measures 18x18x15 inches. Will handle up to forty 11x14-in. prints per hour. Heavy-duty variable-speed, 120-volt universal motor draws 350 watts, may be plugged into any outlet. Replaceable and washable cloth belt is self-aligning and self-tightening, according to manufacturer. Prints may be fed on the apron face up or down as desired. Fedco Products, 37 Murray St., New York.

•

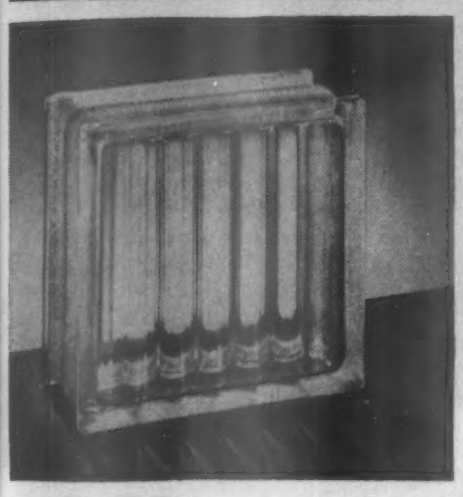
Air Cylinder

Air cylinder, designated the JLE, is available in standard bore sizes from 1½ to 10 inches in diameter, in five standard mountings, and can be obtained in any stroke specified. Top operating pressure is 110 p.s.i. The James L. Entwistle Co., 43 Church St., Pawtucket, R. I.

•

Condensate Return Units

Line of automatic condensate return units, suitable for use with steam plants and in establishments using steam process equipment, handles pressures up to 150 pounds and radiation up to 35,000 square feet. Furnished with turbine-type pumps to handle hot condensate at high pressures without vapor binding or water hammer, according to manufacturer. Unit includes electric motor, strainer, float switch or make-up valve, welded steel receiver, and heavy



Better lighting at lower cost is one way PC Glass Blocks pay for themselves

• PC Glass Blocks distribute an ample supply of diffused daylight over large workrooms. They can direct light to areas far from lighting panels, thus making additional floor space useable and reducing the cost of artificial lighting. Through better light diffusion they give employees greater eye-comfort.

In addition, PC Glass Blocks possess insulation values that reduce heating and air-conditioning costs. They dampen disturbing sounds and exclude distracting outdoor views. And panels of PC Glass Blocks can be kept clean easily and economically. These are some of the ways in which installations of PC Glass Blocks will pay for themselves over a period of years.

Our technical staff will be glad to discuss your lighting problems with you, to show you where and how you can use PC Glass Blocks to the best advantage.

Meanwhile, why not send for our illustrated, descriptive booklet? It shows a wide variety of installations of PC Glass Blocks in industrial plants and offices. Just mail the convenient coupon and we shall be glad to send you a free copy. Pittsburgh Corning Corporation also makes PC Foamglas Insulation.

PC GLASS BLOCKS... the mark of a modern building

PITTSBURGH PC CORNING ® GLASS BLOCKS

Distributed by PITTSBURGH PLATE GLASS COMPANY
by W. P. Fuller & Co. on the Pacific Coast and by Hobbs Glass Ltd. in Canada

FOR ADDITIONAL INFORMATION SEE OUR INSERTS IN SWEET'S CATALOGS.

Pittsburgh Corning Corporation
Room 683-8, 632 Duquesne Way
Pittsburgh 22, Pa.

Please send along my free copy of your new book on the use of PC Glass Blocks for industrial buildings. It is understood that I incur no obligation.

Name_____

Address_____

City_____ State_____

Exceptional Adaptability

Measuring the dimensions and orientations of punched holes in radio tube micas, to tolerances of .0001", on a Jones & Lamson Optical Comparator. Photographs courtesy Hytron Radio & Electronics Corp.

This is a typical example of the adaptability of Jones & Lamson Optical Comparators to unusual inspection needs. These Comparators are designed to cover an almost unlimited range of inspection work—they provide a means of inspection that is accurate, rapid and economical. Costly gages can be dispensed with, costly time saved and quality improved.

Many components and products formerly inspected by slow, tedious methods that retarded production and drained profits, are now inspected in a matter of seconds or minutes on Jones & Lamson Comparators, with consequent savings all along the line.

Our engineers are inspection specialists, their knowledge of holding fixtures, handling methods and suitable Comparator equipment, qualify them to study your inspection problems, no matter how unusual, and make recommendations that will improve your profit picture. They have for others.

Write for descriptive literature. Or, better still, ask for one of our inspection engineers to call.

JONES & LAMSON MACHINE COMPANY
6 Clinton St., Springfield, Vermont, U.S.A.

Manufacturer of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Double-End Milling and Centering Machines · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies and Chasers · Ground Thread Flat Rolling Dies

Jones & Lamson
OPTICAL COMPARATORS

steel base. Available in a number of types, sizes, and models to provide service for a wide range of applications, and as duplex units, equipped with two pumps, to provide standby protection or additional capacity if needed. Roy E. Roth Co., Rock Island, Ill.

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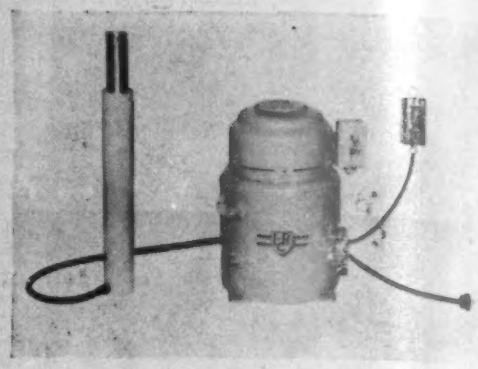


Hydraulic Pump

Package-type hydraulic power unit which delivers 1½ gallons of oil per minute and develops a pressure of 1000 p.s.i. uses a flange-mounted motor placed directly on top of the 2½-gal. oil reservoir. Pump assembly measures 18¼x12½ inches. The valves use an "open center" arrangement which permits the motor to idle except when unit is pumping oil to the pressure lines. Furnished with main starting switch, and push-button. A foot control switch is optional. Three-way valve for operating a single action hydraulic cylinder is standard, but four-way valves may be obtained. Motor is ¾-hp. a.c., and is available for 110-, 220-, or 440-volt service. Lyon-Raymond Corp., 5840 Madison St., Greene, N. Y.

•

Counter

A mechanically operated counter, Series 1260, adaptable to any standard drive, from either side, may be built into a machine or product as standard equipment to provide direct readings. Over-all dimensions are 4½x 1 9/16x1¼ inches; weight, 12 ounces. Ratchet type provides 1000 counts per minute; rotary ratchet type, 1500; revolution type, 2000. Veeder-Root, Inc., Hartford 2, Conn.

•

Cable Stripper

Ripper, No. 9020 EZ, for stripping all types of non-metallic cable sheaths, braided or plastic, is made of steel, case-hardened and cadmium-plated. It measures 2½x1¼ inches, is composed of two hinged parts. In operation, the end of the cable to be

CHECK WORK by .0001" to .00001"
AS FAST AS FINGERS CAN FLY

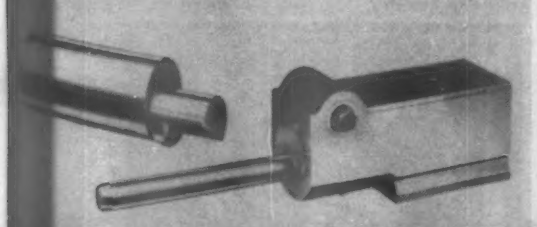
Production gaging with External Comparator No. 951 and Amplifier 950.

with this UNIQUE *Electronic* MEASURING EQUIPMENT

ADVANCED design and construction features make this Brown & Sharpe Measuring Equipment unusually fast, accurate and dependable. Its separate amplifier, for example, completely isolates heat-producing elements . . . thus prevents temperature drift in gaging units. Its true linear response permits accurate setting for the entire scale with only one master block. A single amplifier may be used to serve several separate testing instruments. Line voltage fluctuations within the range of 105 to 125 volts do not affect readings.

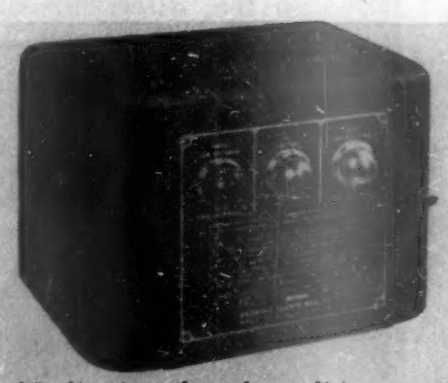
These and other advantages make precision gaging on a mass-production basis both practical and economical for any plant or laboratory. Get all the facts about this unique Electronic Measuring Equipment. Write Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor



Speedy Internal Gaging from ½" to 2" is provided by Internal Comparator Attachment No. 952. For use with External Comparator No. 951.

Extremely Accurate Gaging (.0001" to .00001") in stands, jigs and fixtures is offered by Gage Head Cartridge No. 953. Plugs in directly to Amplifier No. 950.



Visual Indication of work conditions show quickly on Signal Light Attachment No. 958. For use with Amplifier No. 950. Easily attached.

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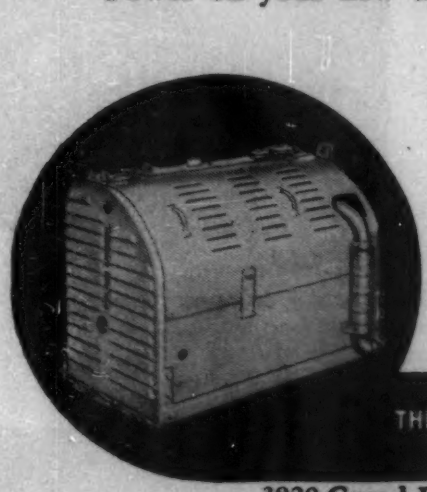
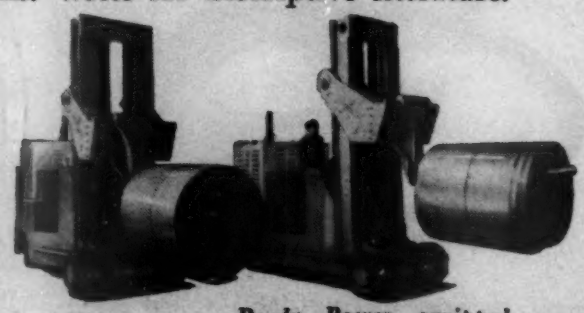
Ready - Power - equipped Elwell Parker Up Ender handling heavy steel coils.

FOR ELECTRIC TRUCK OPERATION AT ITS BEST!

Ready-Power-equipped electric trucks provide more power for heavy loads, more continuous hours of service and more materials handled in any given period. Dependable electric power is generated right on the truck chassis by an engine-driven, direct-current generator. Get the most out of your electric trucks. Convert them to Ready-Power. Specify Ready-Power on your new trucks. Write for descriptive literature.



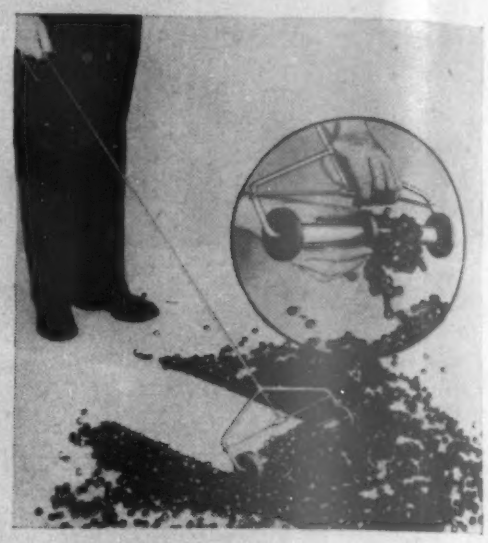


Ready - Power - equipped Automatic Ram Trucks handling steel coils.

THE READY-POWER CO.

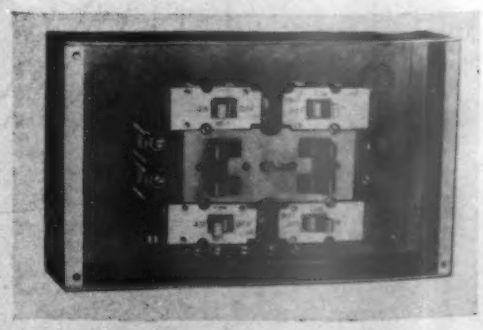
3820 Grand River Ave., Detroit 8, Michigan

stripped is laid on the rounded bottom channel of the tool. The hinged top is then closed, and firmly pushed down on the cable, forcing a rudder-shaped ripper through the sheath. The ripper is then pulled forward, slicing the sheath as it moves. According to the manufacturer, the ripper will not score the copper conductors. National Electric Products Corp., Chamber of Commerce Bldg., Pittsburgh 19.



Rotary Magnets

For use in separating ferrous from non-ferrous materials, picking up steel or nails, cleaning tramp iron from conveyors, and similar work, non-electric Alnico Multilift rotary magnets are small, lightweight. Manufacturer claims that they will retain their strength permanently. They are sealed in a metal tube mounted between Neoprene wheels in the carrying frame. Handle is attached to frame, and unit is rolled. The tube revolves with the wheels, and the entire magnetic surface becomes loaded. Capacity depends on size, weight, and iron content of load components. Unloading is accomplished by pushing Neoprene wiper ring to a non-magnetic area at one end, where load drops off. "Grabbing" is prevented by the height of the wheels. Parts jump up 1 or 2 inches to the tube. Available in various sizes and materials suited to the intended uses. Standard wheel diameter, 2 5/9 inches; length of smallest model, 9½ inches; larger units, 13¾, 18, and 22¼ inches. Multifinish Mfg. Co., Dept. 366, 2114 Monroe Ave., Detroit 7.



Sectional Multi-Breaker Units

Multi-breaker service and load center, Type MB4 Ad-On, consists of a 4-pole basic unit with provisions to

These 'Drill Masters' Develop Precision in Wickwire Rope

The workability and durability of wire rope is largely dependent upon accurate coordination of each wire in the rope. Because off-size wire can cause excessive friction and internal rope wear and early failure in service, every wire must be perfect in shape to fit into the exact geometric construction pattern of the rope.

Knowing this requirement—and knowing *how* to meet it—rests to a large extent with the men in the Die Department at Wickwire. These skilled craftsmen are perfectionists gifted with a passion for accuracy. Using special precision machines (some designed by men in the department), these patient, keen-eyed 'drill masters' create wire drawing dies drilled and ground to an accuracy within .0003 of an inch.

Such scientific precision characterizes every step in Wickwire Rope production. Small wonder then, that it is the choice of those who demand the utmost in performance, safety and long life. You can depend upon Wickwire Distributors and Rope Engineers for practical help in solving your wire rope problems. See your local Wickwire Distributor for Wickwire Rope in all sizes and constructions, both regular lay and WISSCOLAY *Pre*formed.

THIS 82-PAGE BOOK ON WIRE ROPE IS FREE. WRITE FOR YOUR COPY TODAY!

Thousands of wire rope users have found that the information packed in the pages of "Know Your Ropes" has made their work easier. It's full of suggestions on proper selection, application and usage of wire rope. It's easy-to-read and profusely illustrated. For your free copy, write —Wire Rope Sales Office, Wickwire Spencer Steel, Palmer, Mass.

WICKWIRE ROPE

A PRODUCT OF THE WICKWIRE SPENCER STEEL DIVISION OF THE COLORADO FUEL AND IRON CORPORATION

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SALES OFFICES—Abilene (Tex.) • Boston • Buffalo • Chattanooga • Chicago • Denver • Detroit • Emlenton (Pa.) • Philadelphia • Tulsa • Fort Worth • Houston • New York

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● Using the NIAGARA AERO HEAT EXCHANGER to cool quenching bath solutions returns the cost of the equipment quickly and gives a bonus in fewer troubles for the heat treating superintendent.

Controlling the temperature of the quench means a uniform product...fewer rejections. Ample cooling capacity independent of water supply eliminates shut-downs because of hot oil. The heat is transferred from the oil to air by the evaporation of a water spray. Only the water evaporated is used and 95% of the water cost is saved.

In hundreds of installations, quenching both small parts and large shapes, production has increased at lower cost. Units operate reliably for years without maintenance troubles in plants that run 24 hours per day.

Niagara Aero Heat Exchangers also give extra value in cooling jacket water for process equipment or engines, hydraulic equipment, electronic sets, controlled atmosphere processes, and many other applications.

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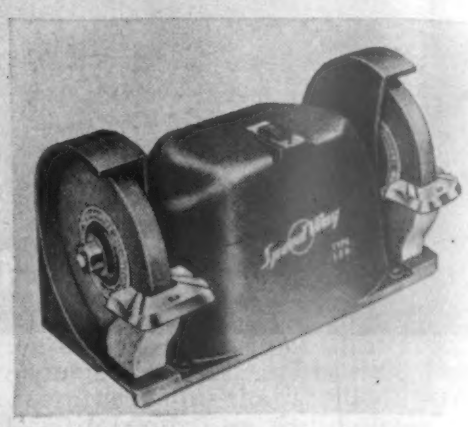
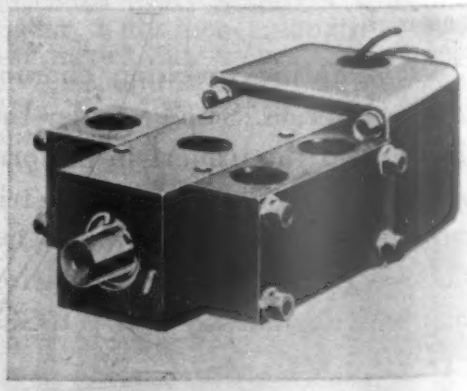
receive four more single pole "Ad-On" units. This permits circuits to be added or changed. Manufacturer states that thousands of circuit combinations can be made from 33 standard basic units and three "Ad-On" units. These are plugged in on main terminals, reducing cost of future circuits by eliminating wiring, nipples, locknuts, and bushings. Can be used for direct switching of lighting and appliance circuits as well as to provide circuit protection. Single poles are calibrated 15, 20, and 30 amperes; double-pole 40- and 50-amp. circuits have individual trip. Maker claims that two-way protection is provided with the high-speed thermal-magnetic tripping in the equipment. Thermal element carries harmless, momentary overloads, but trips if overload continues. Magnetic element trips quickly on "shorts" to localize possible damage. Both flush and surface type enclosures available, with mains rated 70 or 100 amperes. Square D Co., 6060 Rivard St., Detroit 11.



Bench Grinder

Electric bench grinder, called Speedway No. 128, is equipped with two 6x¼-in. grinding wheels, and adjustable tool rests with pre-set angles for sharpening drill bits, plane blades, chisels, and other cutting tools. The grinder measures 14x8 inches, and weighs 22½ pounds. Powered by a ¼-hp. a.c. 2-pole shaded pole motor; no-load speed, 3500 r.p.m. on 60 cycles. Speedway Mfg. Co., 1834 South 52nd Ave., Cicero 50, Ill.



Selector Valve

Line of a.c. solenoid-operated four-way selector valves, designed for service with water, oil, or air, at operating pressures to 250 p.s.i., includes pipe sizes of ¼, ⅜, ½, ¾, and 1 inch. Valves may be converted for d.c. operation by changing solenoids. Manufacturer states that metal-to-metal contact of sealing

"HANDLING COSTS STAY LOWEST WITH Battery Powered TRUCKS"

"Here's a tip from our experience: Watch *over-all* costs—not first costs alone—when you compare industrial trucks.

"For a true comparison, *all* charges—for power or fuel, maintenance, down-time for repairs, as well as interest, depreciation and so on—should be boiled down to one figure, *cost per shift operated,* for each type of truck.

"Using this yardstick, we found that our material-handling outlay was always lowest with *battery power.* Reason enough, isn't it, why we've settled on electric trucks?"

Users who compare industrial trucks on the conclusive basis of *over-all cost per unit of work done* point to these basic savings when storage batteries are the source of power:

USE LOWEST-COST POWER AVAILABLE—Storage batteries bring to mobile equipment the use of central station power—energy of lowest and constantly decreasing cost. Thus the electric industrial truck demonstrates, consistently, an operating cost well under that of other types.

NO IDLING COST—In the intervals between actual load movements, batteries impose no expense for "fuel" or wear. Not only do they give the needed surges of power instantly, but they cut off instantly—so that there is absolutely no power consumption during stops.

TRIFLING MAINTENANCE COSTS—Batteries have no moving parts. A long record of sales of parts by battery manufacturers shows, on the average, a value of about 85 *cents* per year for each battery in service. Preventive maintenance takes but a few minutes weekly.

These facts—plus the characteristic ruggedness, dependability and safety of battery-driven units—help explain why over 90% of the electric trucks sold in the past twenty years are still in constant service.

SEND FOR THESE FREE MANUALS

Even if your present system is mechanized, the MATERIAL-HANDLING HANDBOOK and UNIT LOADS offer new suggestions for lowest-cost material handling. Your letter will bring them.

THE ELECTRIC INDUSTRIAL TRUCK ASSOCIATION
29-28 F Forty-first Avenue, Queens Plaza, Long Island City 1, N. Y.

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INDUSTRIAL MAINTENANCE SET No. PE 20
Handles Most HEAVY DUTY PULLING JOBS with MINIMUM INVESTMENT in EQUIPMENT
Built especially for use on heavy machine tools, turbines, marine engines, mining machinery and other large equipment. In mills, factories, railroad shops, utility plants, shipyards, mines, etc., it removes and installs large gears, bearings, wheels, pulleys, etc., without damage to expensive parts and at reduced maintenance costs. Other OTC Industrial Maintenance Sets to fit any need.
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Depend on your nearest OTC Distributor for Maintenance Tools. LOOK for this Sign—
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members eliminates dirt and other foreign material. Valve is two-position spring-loaded in normal position. Measures 7-13/16x5¼x3½ inches. Saval, Inc., 1915 East 51st St., Los Angeles 11.

•

Motor Capacitor

Pyranol motor capacitor, designed to withstand the same physical treatment as the motor itself, is available in all popular ratings. Enclosed in 10-gage steel tubing, the bushings are of silicone, impervious to oils, acids, and alkalis. The steel mounting bracket is spotwelded to the capacitor enclosure. Long Flamenol leads are protected by insulating eyelets where they pass through the enclosure, and are said to be unaffected by baking heat, oil, water, or mild acids. General Electric Co., Transformer & Allied Products Div., Schenectady 5.

•

Fork Truck

Tilting telescopic fork truck, called Worksaver, has a capacity of 3000 pounds and was designed to make possible maximum use of available headroom in high-stacking operations. Suitable for use in reaching mezzanines, servicing overhead cables and ducting, and in loading trucks and rail cars from ground level. The 120-in. reach, combined with a lowered clearance of 83 inches, is accomplished by means of a ram-within-a-ram. When an outer hydraulic piston has fully extended upward, an inner one begins to extend downward, doubling the lift available. It travels at 2 m.p.h. under full load, lifts 8 f.p.m. with 2500-lb. load, and tilts 18 degrees in 10 seconds, according to its maker. Its

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Inside and outside your plant, the best money-saving guardian of your property against agents of destruction is *Liquid Aluminum*—aluminum paint made with Reynolds Pigments.

Metal coated with *Liquid Aluminum* stays rust-free . . . resists corrosion from smoke and fumes. Built-up roofs won't dry out or crack . . . and the reflectivity of *Liquid Aluminum* bounces back the sun's rays, keeping under-roof temperatures up to 15° cooler in summer.

Liquid Aluminum dispels darkness . . . brightens interior walls. Up goes worker efficiency, down come lighting bills.

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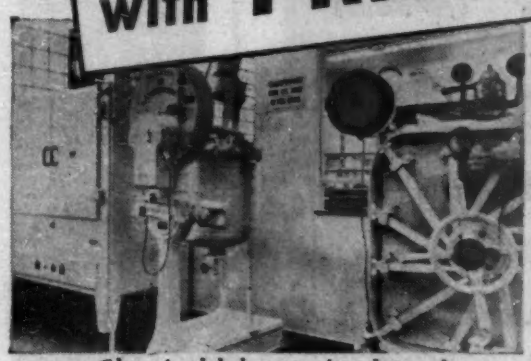
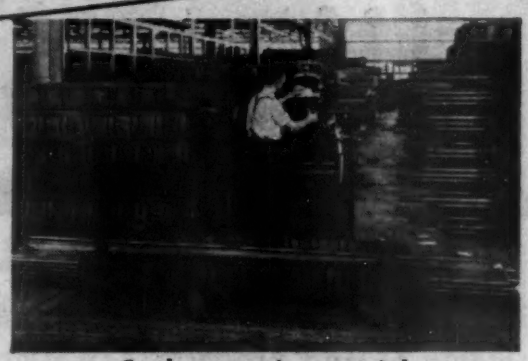


Chemical laboratories depend on Printweigh accuracy.



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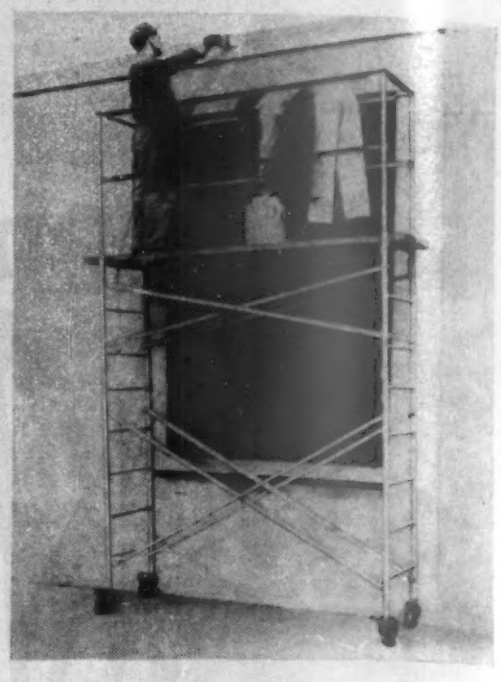
Send for this ➡

New illustrated bulletin No. 2021 shows Better Ways to control costs.

TOLEDO

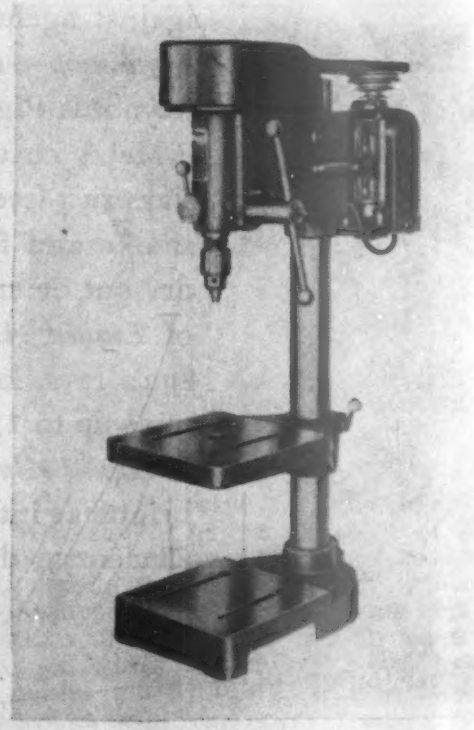
HEADQUARTERS FOR SCALES

dimensions, 33x64 inches, make it useful for work where aisle space is narrow, for entering freight cars, and in elevators. Yale & Towne Mfg. Co., Materials Handling Div., Philadelphia.



Sectional Steel Ladder Scaffolding

Suitable for use in confined working areas, sectional steel ladder scaffolding is 24 inches wide. Fitted with casters so that it may be moved as the job progresses, or rolled from job to job. The four heights, 3, 4, 6½, and 10 feet, make it adaptable for painting, plastering, and general maintenance, or incorporation in a general scaffolding set-up for hard-to-reach places. Steel Scaffolding Co., Brooklyn, N. Y.



Drill Press

Fifteen-inch drill press features a depth stop which operates directly on a feed pinion between two quill bearings. This is said to eliminate side thrust and deflection of drill point. Gage is calibrated in sixteenths; spindle has a travel of 4 inches, with four speeds from 630 to

NEW!

REPLACE EXHAUSTED AIR WITH TEMPERED FRESH OUTSIDE AIR

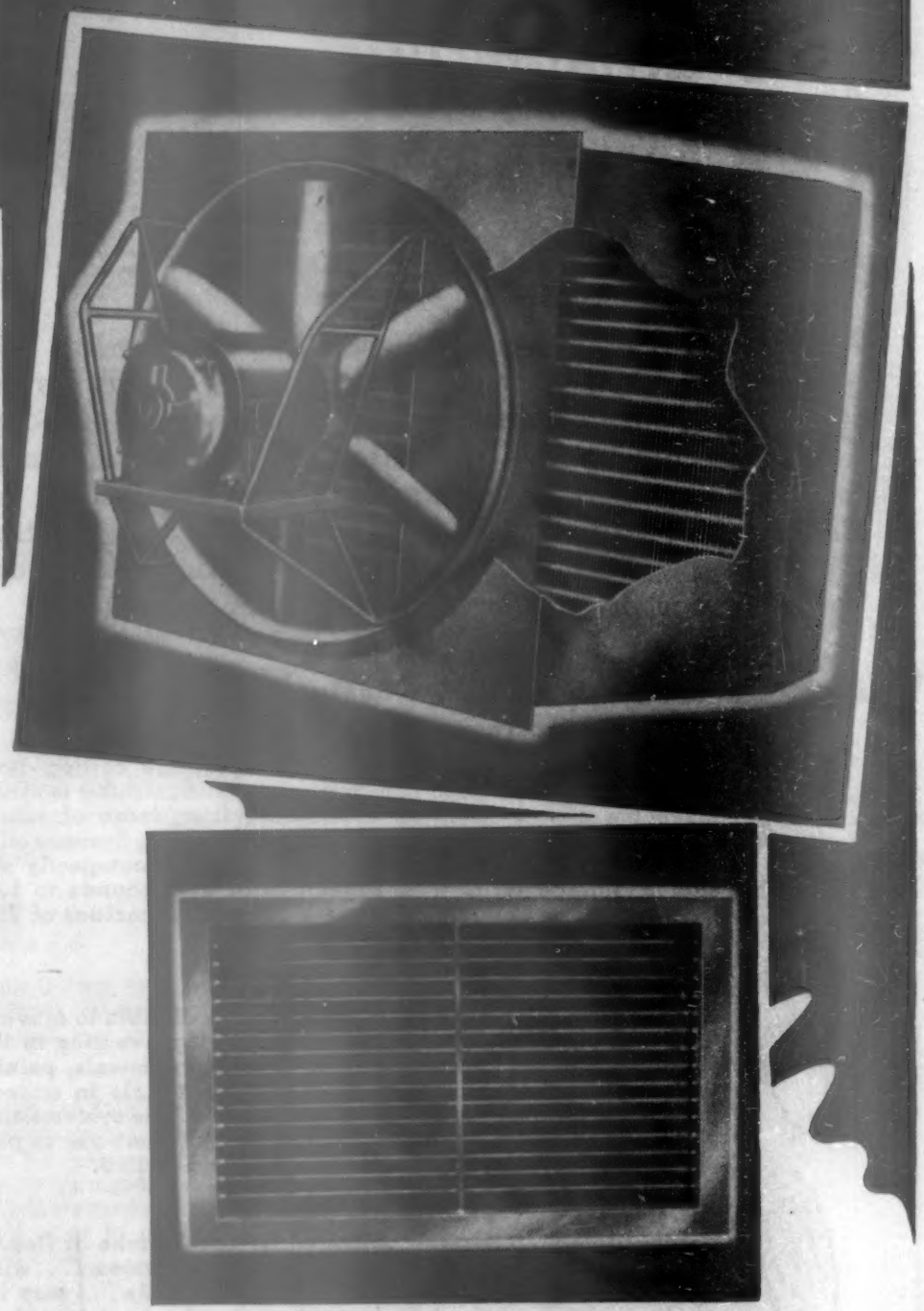
Does a gale of chilly air sweep into your plant when a door is opened? Can you locate cracks and crevices by the flow of cold outside air near them? When your exhaust system is at full operation does it seem to function with less than normal efficiency?

Even if you have not noticed such signs, if you operate an exhaust system without compensating for the air it removes you are "starving" your exhaust fans. Lack of air behind them is as bad as excessive pressure in front of them. It gives the same result—inefficient operation. In addition, it brings in cold air, producing cold spots.

The new Hartzell Intake Air Unit overcomes these troubles in one compact, simple package. It introduces the air needed to balance the exhaust system. It tempers the incoming air to the temperature you select—filters it, too, if you wish. It therefore increases ventilation efficiency and at the same time improves working conditions.

It comes as a complete, self-contained unit, easy to install, and operates with practically no attention. Provision is made for air filters; frame and filters are provided when desired. Automatic and manual controls of various types are also available.

Bulletin 2101, just off the press, gives details of this new development. It's free on request.



The Hartzell core, properly installed and operated, will not freeze.

HARTZELL PROPELLER FAN CO.

DIVISION OF CASTLE HILLS CORPORATION

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PROPELLER-TYPE FANS AND BLOWERS • ROOF VENTILATORS • UNIT HEATERS • ENGINEERING OFFICES IN PRINCIPAL CITIES

Complete FIRE PROTECTION HAS 3 VITAL PHASES

- *EXTINGUISHMENT*
- *PREVENTION*
- *DETECTION*

Are you sure that each of these links in *your* fire protection program is as strong as it should be? A careful analysis of your fire hazards now . . . in the light of recent developments in fire protection methods and equipment . . . may save you staggering fire losses later. Let Cardox . . . a leader in all three phases of fire protection . . . help you make this property-protecting check-up! The only cost to you is a small investment in time.

CARDOX offers all THREE

EXTINGUISHMENT

Cardox engineered applications of low-pressure carbon dioxide give this fast-acting, non-damaging extinguishing medium maximum effectiveness in conquering fires, large or small, both indoors and out. Cardox Fire Extinguishing Systems offer broadscale protection with centrally located, compactly designed storage units with capacities of 500 pounds to 125 tons of Cardox CO_2, and Mobile Units with capacities of 750 pounds to 3 tons. Bulletin S-198.

PREVENTION

Cardox Atmosphere Inerting Systems are available to provide inert gas for continuous fire and explosion prevention in the handling and storage of flammable liquids, chemicals, paints, varnishes, and solvents, or where other materials in storage present serious fire and explosion hazards. These systems also are used to provide an economical source of inert gas as part of continuous production processes. Bulletin C-198.

DETECTION

Cardox Detection Systems, actuated by heat, smoke or flame, give prompt warning of incipient fires. These systems . . . with detectors located throughout large establishments . . . may be used purely as a warning device, or may be engineered to actuate an extinguishing system.

CARDOX

CO_2 FIRE EXTINGUISHING SYSTEMS

CARDOX CORPORATION • 307 North Michigan Avenue, Chicago 1, Illinois

DISTRICT OFFICES: NEW YORK • PHILADELPHIA • PITTSBURGH • CLEVELAND • DETROIT ST. LOUIS • SAN FRANCISCO • SAN DIEGO

4850 r.p.m. Free-floating drive design is said to prevent whip or misalignment, and is carried in two sealed ball bearings. Drive is through involute splines and mating involute keys. Two additional sealed ball bearings carry the spindle. Both table and base have working surfaces measuring 10x10 inches, and are provided with parallel slots for ½-in. bolts. Reypo Corp., 1233 Lincoln Blvd., Santa Monica, Calif.

•

Battery Cable Clamp

Designed to permit easy removal for inspection or cleaning, Model B-319 battery cable clamp is made of two cast aluminum pieces, hinged together, a split steel nut, and a 122-lb.-pressure steel spring. The spring keeps the connection tight despite shock or vibration, and eliminates loosening of the battery post or breaking the top of the battery cell on removal. The threaded steel nut fits over the cable, and screws into the body of the clamp. Cadmium plating on both the nut and spring resists corrosion from battery acids and fumes. James A. Stanley Co., 277 Broadway, New York 7. 39.

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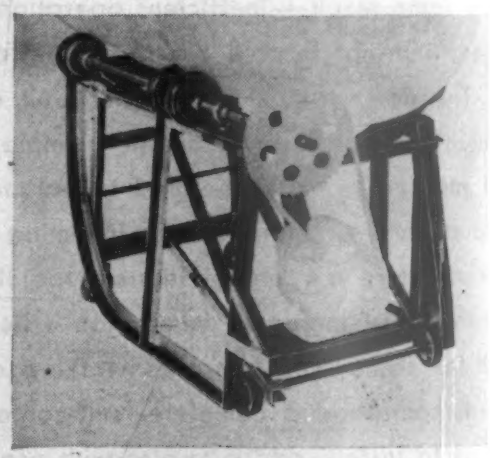

Drum Truck

Portable, all-welded drum truck, called Rotator, rotates 30- or 55-gal. steel drums by means of a small electric motor. It is suitable for mixing and blending liquids, or powders; for tumbling and cleaning small parts; and for cleaning the inside of used steel drums. It will revolve a maximum drum load up to 500 pounds at speeds up to 50 r.p.m. with a ½-hp. motor. Swivel casters, retractable by foot lever, are at front end for steering. An extension nose piece at the front makes possible the loading and unloading of the drum without use of a crane hoist. Drainage of the drum can be made from front or bottom, because one side of

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INFRARED HEAT

with the improved, all-Metal

CHROMALOX

Radiant Heaters

The speed, economy and dependability of infrared heat for baking, drying and heating are well known.

Now—to broaden the uses for infrared heat, CHROMALOX Engineers have designed the all-metal, heavy-duty CHROMALOX Radiant Heater that withstands shock, vibration, dust and moisture . . . that operates efficiently in low *and* high ambient temperatures . . . and that provides glareless infrared radiation in the longer wave lengths which are absorbed almost equally well by all colors, textures and types of surfaces.

Check these Points . . .

FLEXIBLE APPLICATION — CHROMALOX Radiant Heaters are used in line-production or stationary applications requiring baking, preheating, dehydrating, curing, mass heating, drying or similar processing. Units may be mounted individually or interlocked to form banks, tunnels, ovens, etc., of any desired shape and length.

HIGH EFFICIENCY— Specially designed Inconel sheathed, CHROMALOX Tubular elements, accurately located in the parabolic reflectors, assure uniform, even heat without hot spots. Alzak, non-tarnishable reflectors direct infrared heat rays with maximum efficiency.

GLASSLESS, ALL-METAL CONSTRUCTION—Extruded aluminum body results in more rugged units that take rough handling without damage; danger of glass breakage is eliminated. Units are compact (only 4 inches deep) and come in nominal lengths of 2, 2½ and 4 feet.

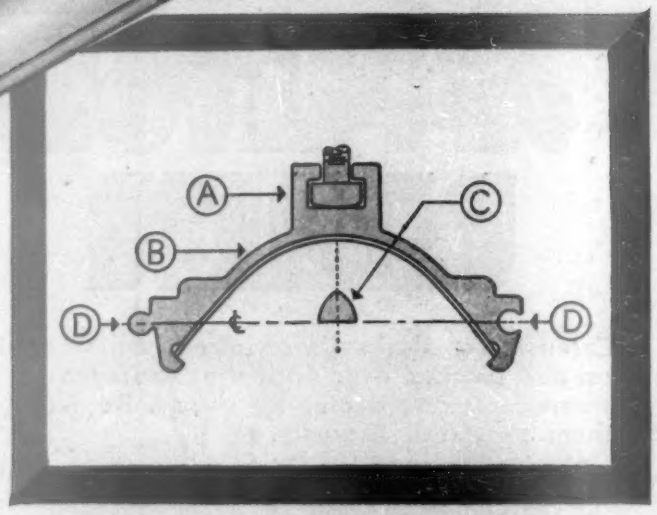
Write for Complete Information

For Specification and Application Data, request Bulletin No. CS-601

CHROMALOX

Electric Heat for Modern Industry

EDWIN L. WIEGAND CO. · 7518 THOMAS BLVD., PITTSBURGH 8, PA.



Designed for Maximum Efficiency, Easy "Interlocking" Assembly, Simplified Installation.

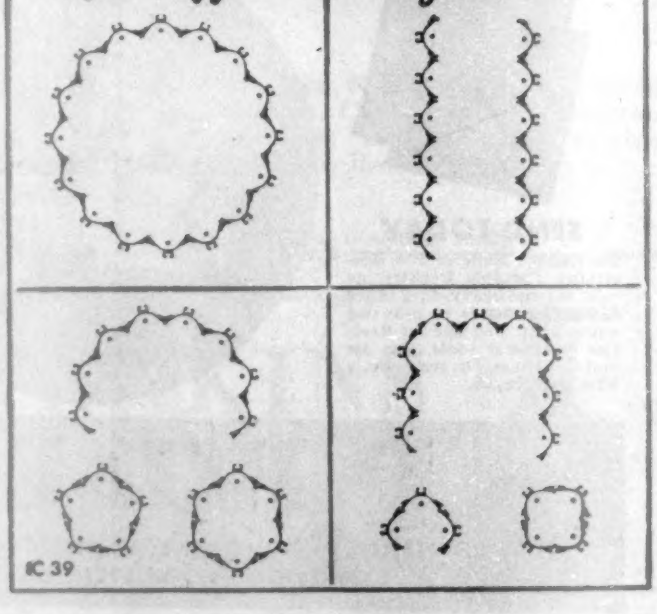
A. Mounting channel has two adjustable captive bolts per section for quickly mounting Chromalox Radiant Heater into position.

B. Extruded aluminum body designed for greatest structural stability, minimum weight; Alzak parabolic reflector fits into grooves in body, is independently replaceable if damaged.

C. Heat source is specially designed Inconel sheathed, triangular cross-section Chromalox element located at the focus of reflector to give maximum direct and reflected radiation.

D. Units are quickly interlocked length-wise; joined sections form a "hinge" joint which permits rotation up to 25° from a straight line.

A few suggested arrangements:



Sure Cure for Extension Cord Headaches

APPLETON REELITE

TRADE MARK

PORTABLE TYPE

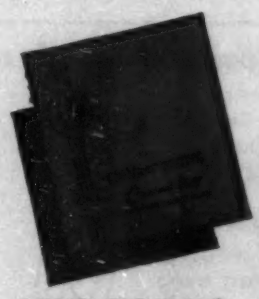
Extension cords that have kinked, been walked on and trucked over until they're frayed and worn can cause damaging shorts. Replacing them constantly is costly.

Extension cord troubles come to an end when Appleton Portable Reelites are installed. They keep cord reeled up and out of the way when not in use. Cord unreels to desired length, against spring tension, and is held by ratchet stop like a window shade.

The Appleton Portable Reelite supplies bright, safe light, exactly where it's needed, in car-loading, stockkeeping, machine-inspection and building-maintenance. Sturdily built . . . lasts a lifetime.

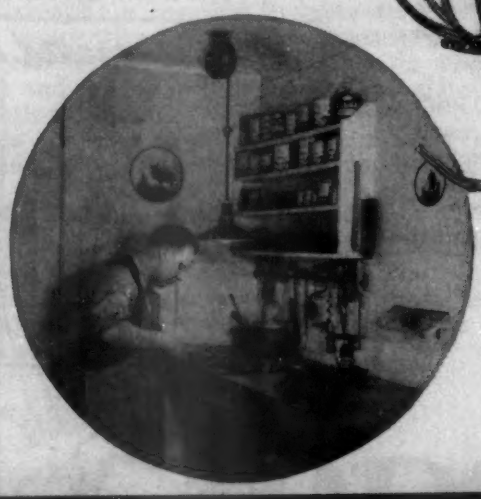
Sold Through Electrical Wholesalers

APPLETON ELECTRIC COMPANY
1715 Wellington Avenue • Chicago 13, Illinois
14 Branch Offices and 7 Resident Representatives in All Principal Markets



SEND TODAY

for 50-page Bulletin 504, describing Portable Reelites, as well as large heavy-duty types for power lines to moving equipment, and special Reelites for power tools, also air and fluid lines. Or, see Sweet's File, page 2a/15.



FOR HOME USE, TOO!

A marvelous convenience in basements, attics, garages. Provides safe light in dark corners and other out-of-the-way places. Also in drop-cord type for over work benches. (see illustration.)

A·P·P·L·E·T·O·N

CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES
EXPLOSION-PROOF FITTINGS • REELITES

the truck frame is open to allow pail or other container to be set on the floor under the drum. Morse Mfg. Co., Inc., Syracuse, N. Y.

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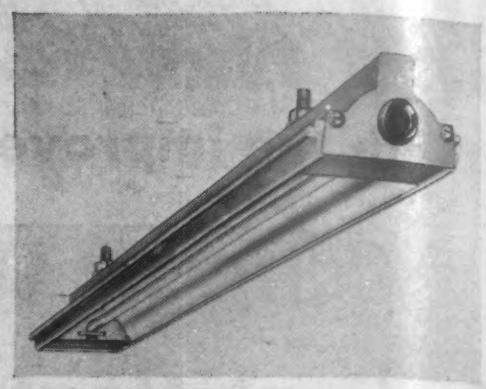


Radiant Heaters

All-metal, glareless electric radiant heater, called Chromalox, was designed for drying, baking, preheating, and dehydrating processes where a high-intensity long-wave infra-red heat source is desired. It has a high-temperature enclosed-type heating element mounted in a rigid extruded aluminum body, with a replaceable reflector sheet of highly polished Alzaked aluminum. Tongued and grooved sides and two sliding captive bolts facilitate fabrication of heater sections into various working positions. Manufacturer states that a negligible amount of visible light is produced from the Inconel-sheathed tubular heating unit, which operates at temperatures of 1000 to 1400 deg. F., depending upon wattage of the heating element. Edwin L. Wiegand Co., 7518 Thomas Blvd., Pittsburgh 8.

•

Turbine-Type Pump

Made of bronze, with a stainless steel shaft and double ball bearings, turbine-type pump, Model 0023, for use in liquid transfer, furnishes pressures up to 80 pounds, speeds up to 2200 r.p.m, capacities up to 8 g.p.m. The single multi-vaned impeller, the only moving part, develops high pressures in single stage construction, and will handle condensate without vapor binding. Available with or without motor, base, and coupling. Roy E. Roth Co., Rock Island, Ill.

•

Volt-Ampere Wattmeter

Portable Model 900B volt-ampere wattmeter, designed for testing a.c. appliances, has a current transformer which will handle ranges of 5000

IN THIS PAPER MILL, as in every plant where fluid control is necessary to operation, there's a valve that is only revealed, as here, by photo-magic. It's the giant you'd see if *all the valves* were *one valve*, and often it represents an investment greater than for large equipment units always chosen with a sharp eye on operating economy.

IT PAYS to keep this collective valve in mind, instead of thinking of valves individually as items of minor expense—for, with wages and material costs higher than ever, valve economy is essential.

EXCESSIVE MAINTENANCE of one inferior valve is insignificant, but multiplied by thousands, it becomes a serious drain on operating budgets.

JENKINS BROS. helps you meet this problem two ways. First, by building extra endurance into Jenkins Valves, making them the longest-lasting, lowest up-keep valves that money can buy. Second, with advice from Jenkins Engineers on proper selection, installation, or maintenance.

For all new installations, for all replacements, rely on Jenkins quality and engineering service for lowest valve costs in the long run. ***Sold through leading Industrial Distributors everywhere.***

•

Jenkins Bros., 80 White St., New York 13; Bridgeport, Conn.; Atlanta; Boston; Philadelphia; Chicago; San Francisco. Jenkins Bros., Ltd., Montreal.

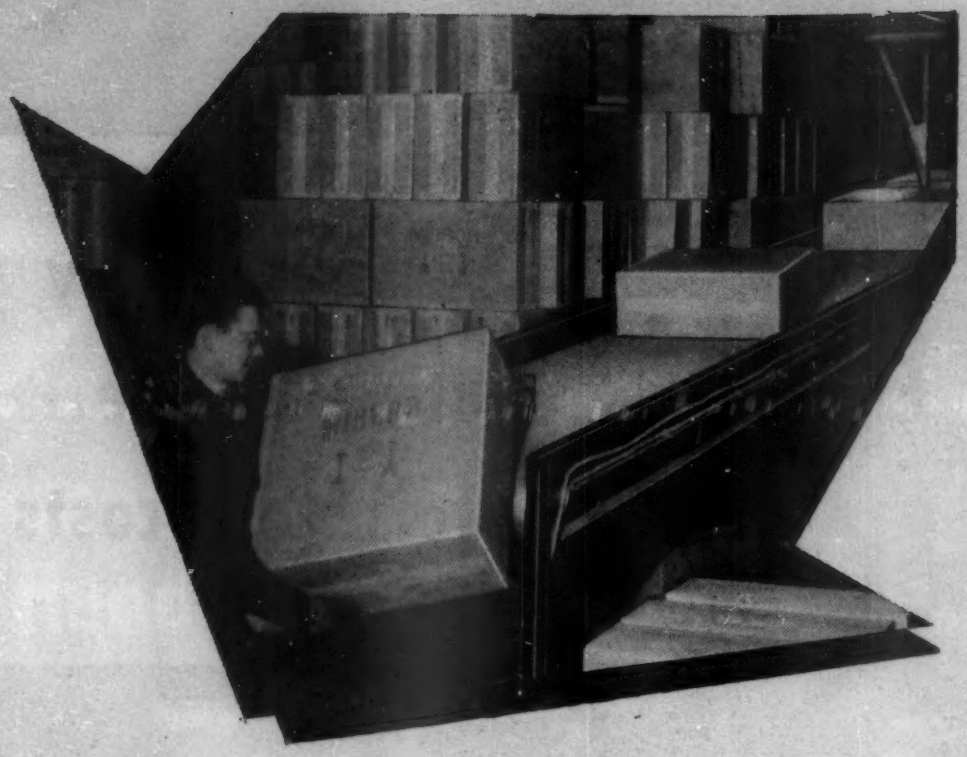
"PREVENT VALVE FAILURE" is a 28-page guide to valve economy, fully illustrated, with case histories of valve damage, and recommendations for its prevention by proper selection, installation, inspection, and maintenance. FREE on request. Write: JENKINS BROS., 80 White St., New York 13, N. Y.

LOOK FOR THIS JENKINS DIAMOND MARK

SINCE 1864

JENKINS VALVES

Types, Sizes, Pressures, Metals for Every Need



A-F *Engineered* CONVEYING SYSTEMS

TO KEEP PRODUCTS FLOWING *Smoothly!*

WHY BE SATISFIED WITH LESS?

Since 1901, Alvey-Ferguson *Engineered* Conveying Systems have been keeping production lines moving swiftly and efficiently in the nation's leading plants.

From the receiving department . . . through the processing of raw materials . . . through the various stages of manufacture . . . thence to storage and shipping—materials and products can be made to flow in an endless stream by means of an A-F Completely Co-ordinated Conveying System. Why be satisfied with less?

If you wish to increase the efficiency of *your* plant and reduce handling costs, why not put *your* materials handling and products handling problems up to A-F Engineers? Forty-seven years of experience in the products handling and materials handling field is at your disposal. A discussion puts you under no obligation. Write Today!

THE ALVEY-FERGUSON COMPANY

139 DISNEY STREET *Established 1901* CINCINNATI 9, OHIO

Offices or Representatives in Principal Cities—Coast to Coast

CONVEYING EQUIPMENT

Alvey-Ferguson

METAL PRODUCTS CLEANING EQUIPMENT

and 10,000 watts, and 65 and 130 amperes. Manufacturer says it will test appliances under actual use conditions, showing wattage consumption, amperes, and line voltage on a 3¾-in. meter scale. The low range of 0-100 watts will measure power consumed by the smallest of appliances. A continuity test consisting of a neon lamp connected between line and load binding post; tests for shorts in power circuits. The Hickok Electrical Instrument Co., 10543 Dupont Ave., Cleveland 8.

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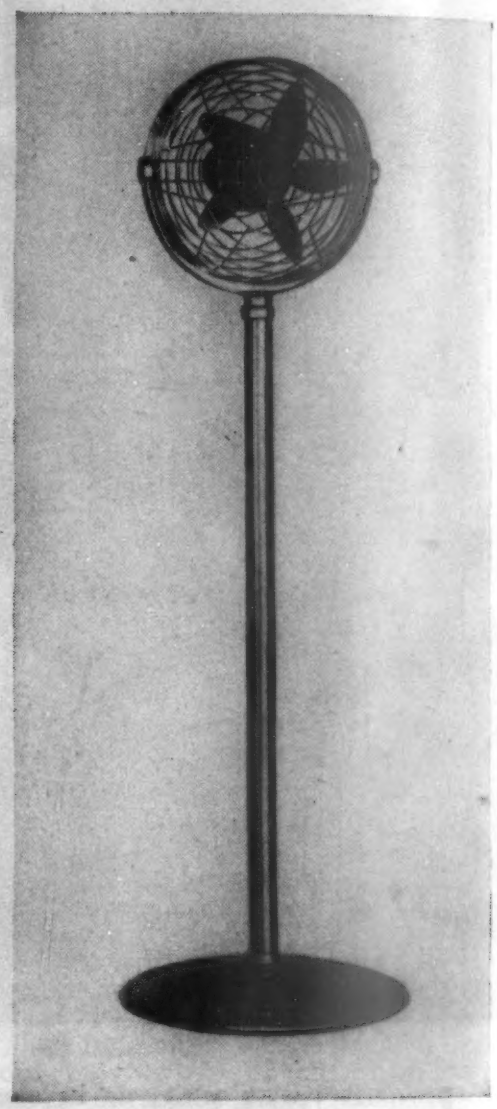


Air Circulator

Pedestal-type air circulator, called Roto-Beam, which uses a balanced propeller molded of bakelite, is designed to move air by induction. Twin air beams are created, one a fast moving "tight" current, the other a large, spirally twisting flow. The differential in pressure between the twin air currents causes all the air in the room to move, according to manufacturer, who states that the circulator is silent, and provides draftless ventilation. It weighs less than 15 pounds. Roto-Beam, 1755 North Keeler Ave., Chicago 39.

•

Guard for Outlet Boxes

When placed in the coverplate frame of outlet boxes prior to plastering, device, called Plasterguard, prevents plaster from getting into and hardening in screwholes and boxes. The guards fit into the frame of the box, and are held by four spring ears. Should the box be plastered over, the steel rusts slight-

FOR

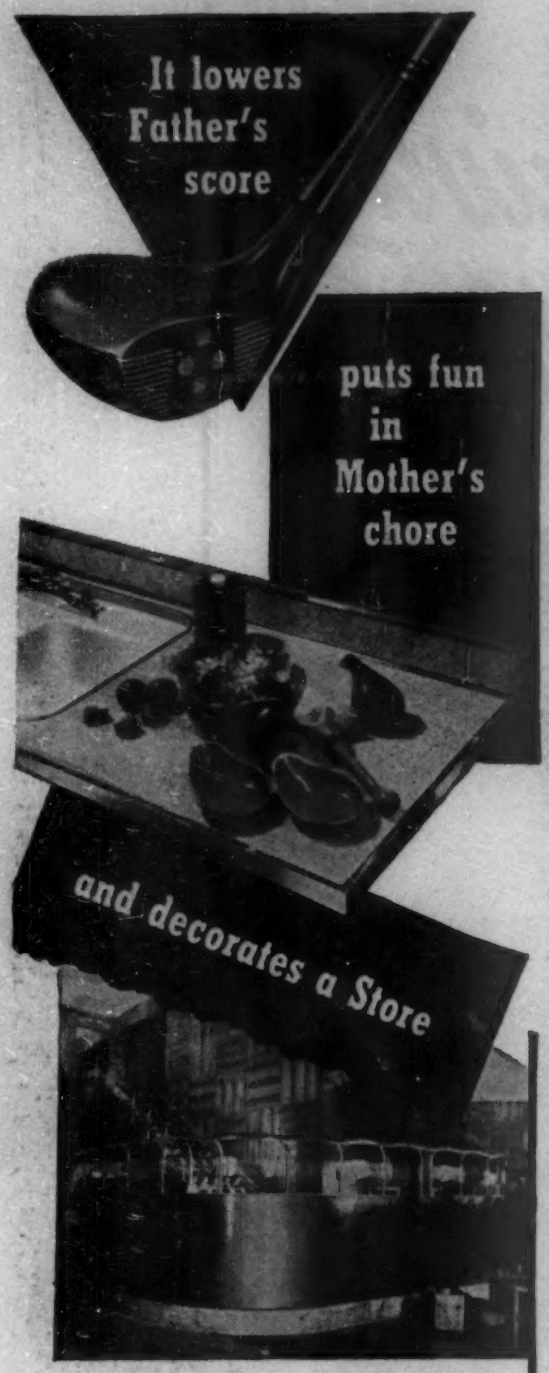
Faster Screw Driving and Nut Setting

...USE ARO IMPACT TOOLS

You can speed up assembly operations—without danger of stretching threads or breaking bolts—by using ARO Impact Wrenches. Proper tension for each application assured by Torque Regulator on the tool. Forward or reversible . . . for Phillips, Reed and Prince, or any cross head or slotted screws . . . up to ⅜" capacity.

There's an ARO precision-built air tool to help you cut production costs from start to finish—for drilling, grinding, screwdriving, other operations. See your ARO Jobber. The Aro Equipment Corporation, Bryan, Ohio.

ARO AIR TOOLS



The "sweet spot" that takes the punishment in many a golf club is "Formica Pregwood". Thousands of sink tops the country over are Decorative Beauty Bonded "Formica". Leading stores, hotels, and restaurants have literally millions of square feet of "Formica Realwood" to serve and please their customers.

"Formica", a high-pressure plastic laminate, is not one material but many.

Detailed literature is available on Industrial or Decorative "Formica". Write to Formica, 4665 Spring Grove Avenue, Cincinnati 32, Ohio.

"Formica" and "Formica Realwood" are trade names, registered in the U. S. Patent Office. "Pregwood" is a Formica Trade Mark.

Beauty Bonded FORMICA at Home with People at Work in Industry

Copyright 1948, Formica, Cinti, O.

ly, showing a brown spot on the wall which locates the concealed box. Once the device has been pressed into the box and removed, a clean cut edge results. O. Z. Electrical Mfg. Co., 262 Bond St., Brooklyn 2, N. Y.

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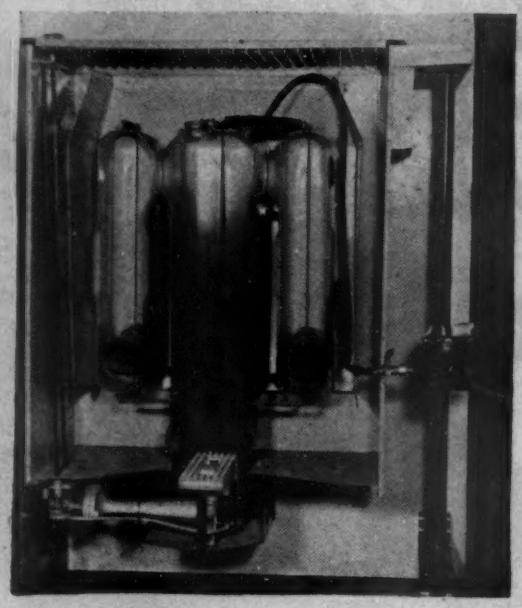

Humidifier

Suitable for use on any type of coal, gas, oil, or gasoline burning equipment, humidifier, called Hot-Spray, has an automatic float valve in the water-supply tank. All-brass and copper construction eliminates corrosion and rust, and manufacturer states that tests have shown that installation of the unit does not exceed one hour. Merchandising Associates, Cliff House, Pueblo, Colo.

•

Change in Ownership

Announcement has been made of the acquisition of the Pennsylvania Forge Corporation, in Tacoma, a suburb of Philadelphia, by Tube Turns, Inc., Louisville, Ky. The business of the new subsidiary, manufacturers of flanges and custom forgings, will continue to be operated under the name of the Pennsylvania Forge Corporation. There will be no change in the personnel of the various departments.

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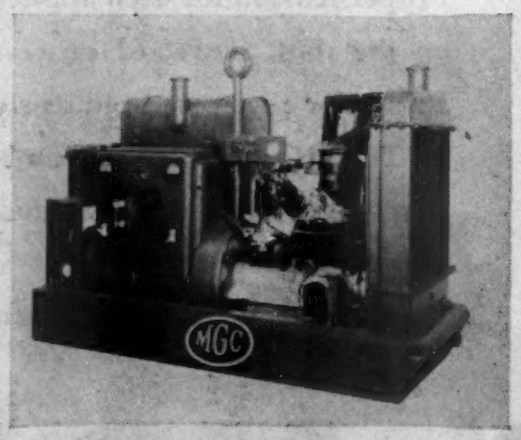


Magnet Generators

Line of gasoline-engine-driven generators, designed for use in supplying power for handling scrap or pig iron with magnet cranes, is available in six sizes, ranging from 5 to 25 kw. Diesel engines can be furnished on

For AIR or GAS at Constant Pressure!

Allen-Billmyre
CENTRIFUGAL TYPE
Blowers and Exhausters

- Inherently Self-Governing
- Quiet and Vibrationless
- Only One Moving Part . . .

Power consumption varies with the load and a constant pressure is maintained through the entire capacity range.

Only two bearings—located well outside of the housing—require lubrication.

External bearings assure clean dry air at all times.

Ample clearances permit normal quantities of dust to pass through the machine without harmful effect.

The impeller assembly—the only moving part—is accurately balanced.

Allen-Billmyre Blowers and Exhausters are highly efficient for Agitation and Aeration . . . Manufacture of Gases, Acids . . . Combustion Processes . . . Conveying . . . Cooling and Ventilation . . . and all low Pressure and Vacuum Requirements

Made in wide range of sizes for ½ to 200 HP

FREE!

Send for Bulletin B-5. Describes Blowers and Exhausters . . . their application and specifications.

ALLEN-BILLMYRE DIVISION
LAMSON CORPORATION
150 Lamson St. Syracuse, N. Y.

A BUYING GUIDE FOR ABRASIVES

ABRASIVE PROBLEM:

Is the correct abrasive available?

ANSWER BY

CARBORUNDUM

TRADE MARK

The Carborundum Company produces the only complete line of abrasives under one trade mark. With industrial techniques utilizing a wider variety of different abrasive products, it is only logical to turn to The Carborundum Company as the one primary source of all abrasive needs.

The specialized service of experienced representatives is available to recommend, impartially, the best abrasive products for specific requirements. Product quality is known and highly regarded. Satisfaction is assured. Responsibility is definitely fixed and undivided.

In part, this helps explain the increasing preference for abrasives by CARBORUNDUM. The Carborundum Company, Niagara Falls, N. Y.

CARBORUNDUM

TRADE MARK

BONDED ABRASIVES

COATED ABRASIVES

ABRASIVE GRAINS AND FINISHING COMPOUNDS

Specialized wheels by CARBORUNDUM for thread grinding
Diamond wheels to meet stiffer technical needs
"Carborundum" is a registered trade mark which indicates manufacture by The Carborundum Company
A coated abrasive for every grinding and finishing condition
All standard shapes are supplied in grinding wheels by CARBORUNDUM

Because it is serviced *fully clean—not just half clean*—a West-maintained washroom helps safeguard many things. Your product, perishable or otherwise, for one. Employe health, plant loyalty, and production efficiency are still others.

In fact, *one germ-free West washroom may frequently go a longer way toward furthering employe relations than a half-dozen "trouble-shooting" conferences.*

West washroom service is thorough for one good reason: where your own janitors, due to lack of time and proper equipment, merely scrape the surface of your washroom problem . . . a trained West serviceman literally gets to the "bottom" of it by thoroughly cleaning the traps and bowls, and *eradicating* the *hidden* cause of annoying washroom odors.

Periodic, efficient and complete—including installation of a modern method of automatic deodorization—this service is extremly economical. Costs nothing extra with your purchase of necessary West Products.

Close to 500 trained West Representatives—from Coast to Coast—are ready to explain the merits of this superior service in full detail. For a quick solution to your washroom maintenance problem, contact us at once.

FREE!

A handsomely illustrated brochure is now available upon request. Just fill in the coupon below to discover how your washroom maintenance costs can be greatly reduced—and how you can obtain the *Free* services of trained West service men.

PLEASE CLIP TO YOUR BUSINESS LETTERHEAD

WEST DISINFECTING *Company*

Dept. F
42-16 West Street
Long Island City 1, N.Y.

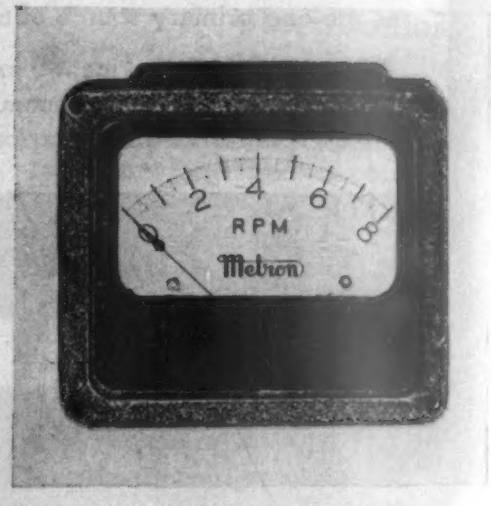
I would like a FREE copy of "An Ideal Washroom Maintenance Service"

NAME_____ POSITION_____

order. Engines and generators are direct connected, and mounted on a common structural steel base. Generators are drip-proof, ball-bearing mounted, self-ventilated, and rated for continuous duty. Furnished with 6-volt battery ignition, pushbutton starter, radiator, fuel tank, assembled ready for service. Motor Generator Corp., Hobart Square, Troy, Ohio.

Rotary Union

Monel metal bellows in all-purpose ball-bearing rotary union is said to eliminate the need for spring loading, to provide self-adjusting pressure on extra-heavy service, and to bring friction drag down to a minimum. It is suitable for introducing steam or coolants into rotary drums, such as used on paper machines, driers, calenders, coaters, and similar equipment. The ball-bearing construction is said to save power, and the flexible hose eliminates the need for installations of pipe and supports. Available in plant, *P*, and syphon, *S*, types. Perfecting Service Co., 6140 Cottage Grove Ave., Chicago 37.



Tachometer Indicator

For use with manufacturer's tachometer heads, single range indicator, Type 43, is mounted in sponge rubber to permit use where severe shock or vibration is present. Aluminum housing provides flush switchboard mounting from front or bracket mounting from the bottom. Electrical head connections are made to terminals on the rear surface, where a calibration adjustment is located. Manufacturer says indicator can be calibrated in any unit, to measure any quantity which is actuated by speeds from 1 to 100,000 r.p.m. Metron Instrument Co., 432 Lincoln St., Denver 9.

Change of Name

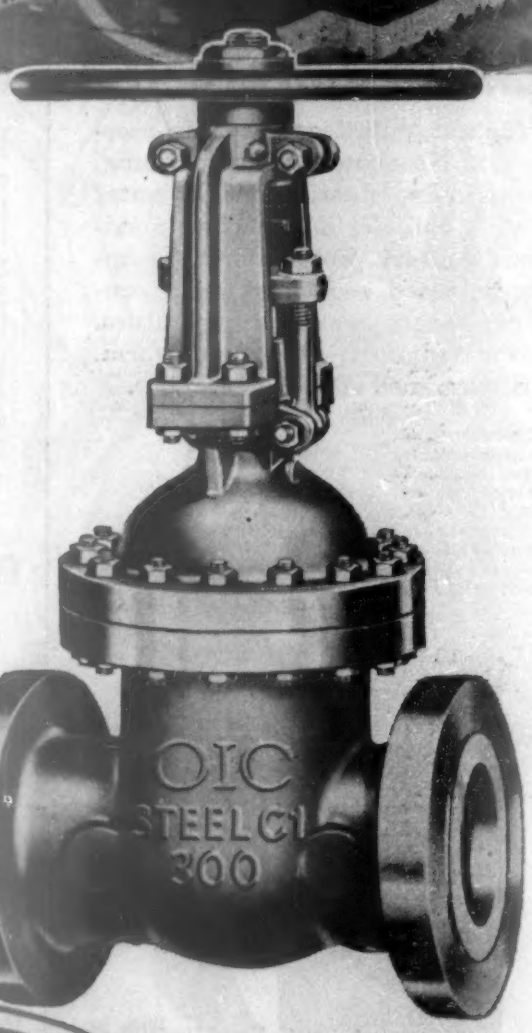
On July 1, 1948, the Plant Rubber and Asbestos Works, for many years owned by The Paraffine Companies, Inc., 475 Brannan St., San Francisco, will officially become the Insulation Division of Paraffine. The plant will continue to manufacture Pabco "Precision-Molded" magnesia insulation and Prasco high temperature insulation at the company's factories at Redwood City and Emeryville, Calif.

OIC

PACE-SETTER
IN VALVES

Everywhere OIC Valves are the trusted guards of industry's vast resources! By day and by night they constantly watch over millions of dollars in industrial materials. Leak-proof joints guard against disastrous pressure-drop. Streamlined designs protect flow from turbulence. Heavier construction throughout keeps pressures and stresses within safe bounds. Wedges of heavy I-beam design keep a close watch on the fluid passageway, stopping all flow with positive, leak-proof closure, or opening the streamlined ports for smooth, even, *free* flow! Integral body ribs guide the wedge to its seats with unerring accuracy—effectively reduce vibration and wear.

Your pipelines are *safer* when they're protected by OIC, Pace-Setter in Valves!



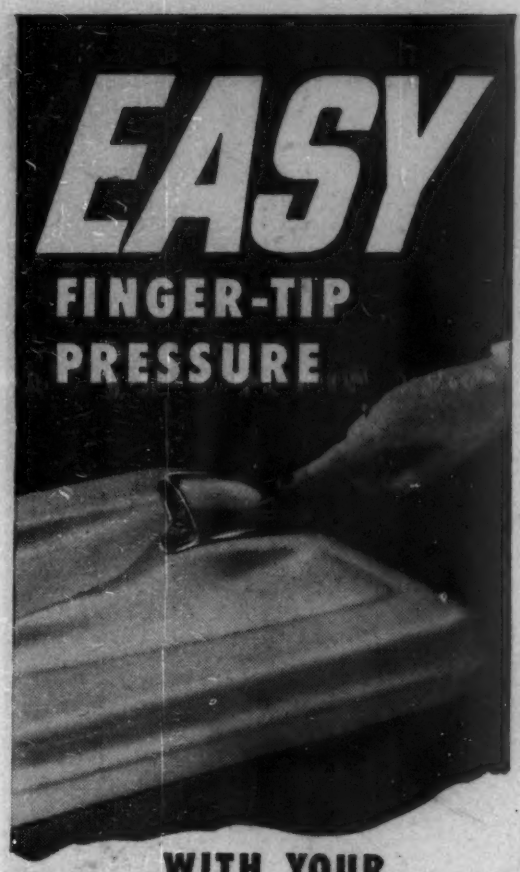
VALVE INFORMATION THAT YOU NEED IS ALWAYS AT YOUR FINGERTIPS IN THE BIG 248-PAGE CATALOG! . . .

Send for your free copy today. You'll save time with the valve data and specifications that you can use so quickly and easily. Simply write The Ohio Injector Company, Wadsworth, Ohio.

OIC VALVES

0-448-6

STEEL • IRON • BRONZE



WITH YOUR

TEMPRITE

DRINKING WATER COOLERS

1. Instant, effortless finger-tip pressure. 2. No spouting, no splashing, no annoying fluctuations in water flow. 3. Bubbler design gives maximum sanitary protection. 4. Temprite patented cooler assures a constant, even water temperature. Never too cold, never too warm. 5. Streamlined stainless-steel top.

All models meet the requirements of the National Bureau of Standards, U.S. Dept. of Commerce. Approved by Underwriters' Laboratories, Inc.

Write for name of your nearest distributor.

Manufacturers to the refrigeration industry since 1929.

TEMPRITE PRODUCTS CORP.

35 PIQUETTE AVE. DETROIT 2, MICH.

YOU WANT TO KNOW

more about the items on this page

Letters to the addresses given will bring you further information.

PERSONNEL SELECTOR called Van Allyn Qualification Inventory. Said to select and place personnel and to establish practical job specifications by which employees' and applicants' qualifications may be appraised. Surveys, Inc., P.O. Box 721, Palo Alto, Calif.

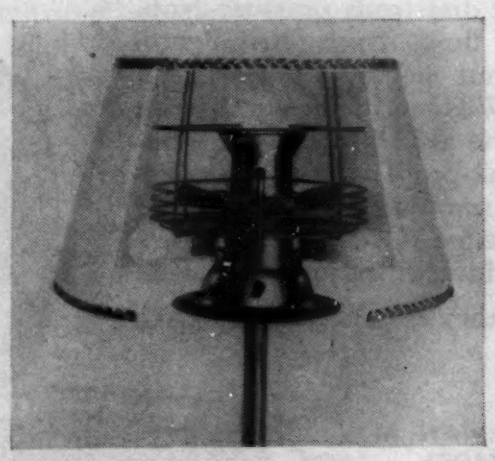
NEW PRODUCT GUIDE BOOK discusses legal, accounting, sales, distribution, advertising problems. Peter Hilton, 680 Fifth Avenue, New York.

EMPLOYEES' UNIFORM SIZES kept on record chart. Space for 25 employees. Measuring chart. Instructions for ordering. Free. Angelica Jacket Co., 1419 Olive St., St. Louis, Mo.

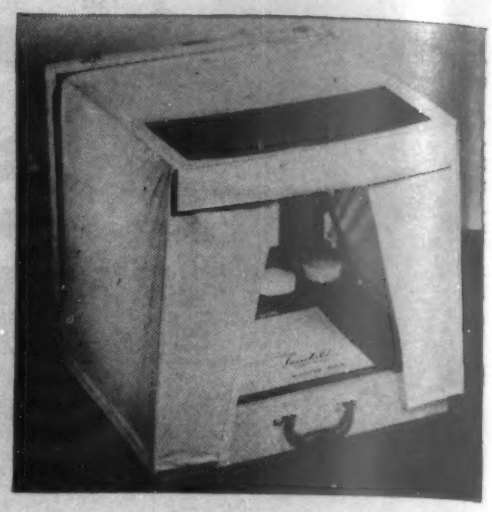
HYDRAULIC TAIL GATE raises or lowers 1500-lb. load. One man can handle pay load. Can be installed on any truck or semi-trailer body. Cemco Industries, Inc., Galion, Ohio.

STENOGRAPHIC TEST for proficiency is pressed on a series of vinylite plastic records. Three groups—language, typing, dictation skills. Simple to score. Science Research Association, 228 South Wabash Ave., Chicago 4.

ADHESIVE for attaching labels to glass, and oily, wet, or hot bottles. Labeltite 405 is said to operate on semi-automatic and automatic labeling equipment. Does not tend to crystallize. National Adhesives, 270 Madison Ave., New York 16.



FAN-LAMP. Direct and indirect lighting. Ten-inch fan moves up to 500 c.f.m. Adjustable speed. Sealed motor. Various shade types. Finished in bronze. Height, 63½ inches. Walton Laboratories, Inc., 1188 Grove St., Irvington, N. J.



PHOTOCOPYING KIT. Will produce letter and legal size photo-exact facsimiles of anything written, typed, printed, drawn, or photographed. Turns out more than 30 copies per hour. No darkroom needed. Fairchild Aerial Surveys, Inc., 53 West Union St., Pasadena 1, Calif.

ADHESIVE PLASTER. Contains ingredients similar to normal components of human perspiration. Said to minimize skin irritation. Rexall Drug Co., 8480 Beverly Blvd., Los Angeles 36.

PAINT REMOVER. Strip-Kwik is non-flammable. Removes films of baked enamel, varnish, synthetic enamels, paints. Chemical neutralization said to be unnecessary. Leon Finch, Ltd., 728 East 59th St., Los Angeles.

BOX SEGREGATOR. Sorts containers by size, brand, grade, color. Operator makes visual selection, presses button. Material automatically segregated. Food Machinery Corp., Riverside, Calif.

AIR FLOW CALCULATOR, circular, monogram type. Finds final pipe diameters, air volumes, static loss, size of Norflo dust collectors. Diameter, 6 inches. Free. Northern Blower Co., 6409 Barberton Ave., Cleveland 2.

ADHESIVE FILM. Scotch-Weld bonds metal to metal, fiber, wood, or plastic. Transparent, non-tacky, 100 per cent adhesive. Rolls. Minnesota Mining & Mfg. Co., 900 Fauquier Ave., St. Paul, Minn.

TRUCK AND TRAILER SIGNAL, vacuum operated. No mechanical connection between truck and van or trailer. Arm is plastic; illuminated along its full length, Vac-O-Lite Signal Co., Inc., 3153 East 82nd St., Seattle.

SOLDERING GUN, electric. Heats in 7 seconds. Tip is copper wire. Two models, both a.c.; 100/130 and 200/250 volts. Weighs 2 pounds 10 ounces. Bur-

FAMOUS QUOTES

HISTORICALLY SPEAKING

"GET THERE FUSTEST WITH THE MOSTEST"*

GENERALLY SPEAKING

★★★★★

"the container is part of the product"

... your products also "get there"—and in prime condition when shipped in General Engineered Shipping Containers.

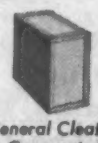
Not only do General Boxes provide "all-round" protection but they are also compact and of lightweight construction. No weight or space is wasted . . . they are designed to the specific product, as "part of the product."

Our Designing and Testing Laboratories at Chicago and Brooklyn are staffed by packaging engineers of long experience. They will be glad to help you design a more economical and more efficient container for your product.

Write today for complete information . . . also for your free copy of "The General Box."

* *Statement of Nathan Bedford Forrest (1821-1877), great Confederate cavalry leader. Volunteered as private in 1861; made a major-general in 1863.*

General Nailed Box



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...engineered shipping containers

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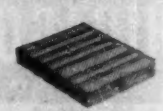

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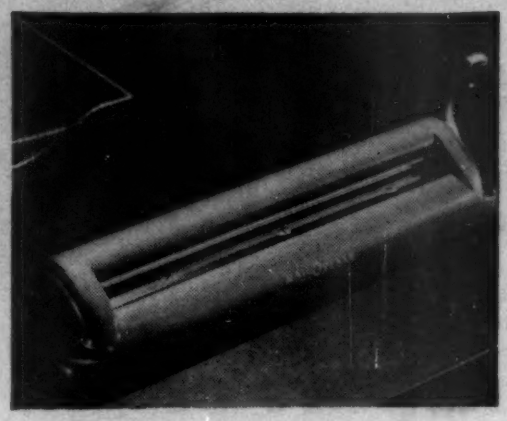
RUBBER STAMP for heavy-duty stamping. Extra-deep characters said not to fill with ink. Die is cushioned with foam sponge. Jas. H. Matthews & Co., 4015 Forbes St., Pittsburgh.

STAPLING GUN. Has controlled power chamber to supply proper drive. For use with electrical wiring. Gets into hard-to-reach places. Staples to fit are supplied in any color. The Heller Co., 2153 East Superior Ave., Cleveland 14.



LETTER OPENER. Desk model. Mail Opener has guarded spiral cutting blade, cuts thread-like edge. One moving part. Housing is aluminum die casting. Shear plate is steel. Size, 16¼x3¾x2¾ inches. Pitney-Bowes, Inc., Stamford, Conn.

REFRACTORY MATERIALS, 3X Firecrete and 3X Blazecrete, are castable, air-hardening. Firecrete is for pouring or casting special shapes. Blazecrete is for pneumatic application. Johns-Manville, 22 East 4t0h St., New York 16.

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METAL DETECTOR. M-Scope Conveyor Belt Locator detects metal objects dime size. Automatically stops conveyor line. Fisher Research Laboratory, Inc., Palo Alto, Calif.

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Extra Savings: Don't divert your millers, shapers, lathes and drills to work that Simonds Band Saws can do *better and faster!*

And don't overlook the opportunity to save by making your own gages, templates, etc., from Simonds Flat Ground Steel Stock cut by Simonds Metal Bands . . . a top money-saving combination. Ask your Distributor.

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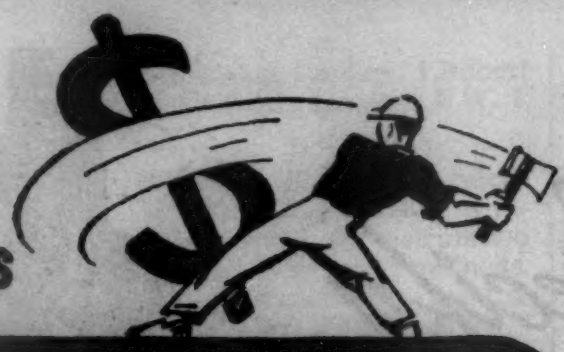
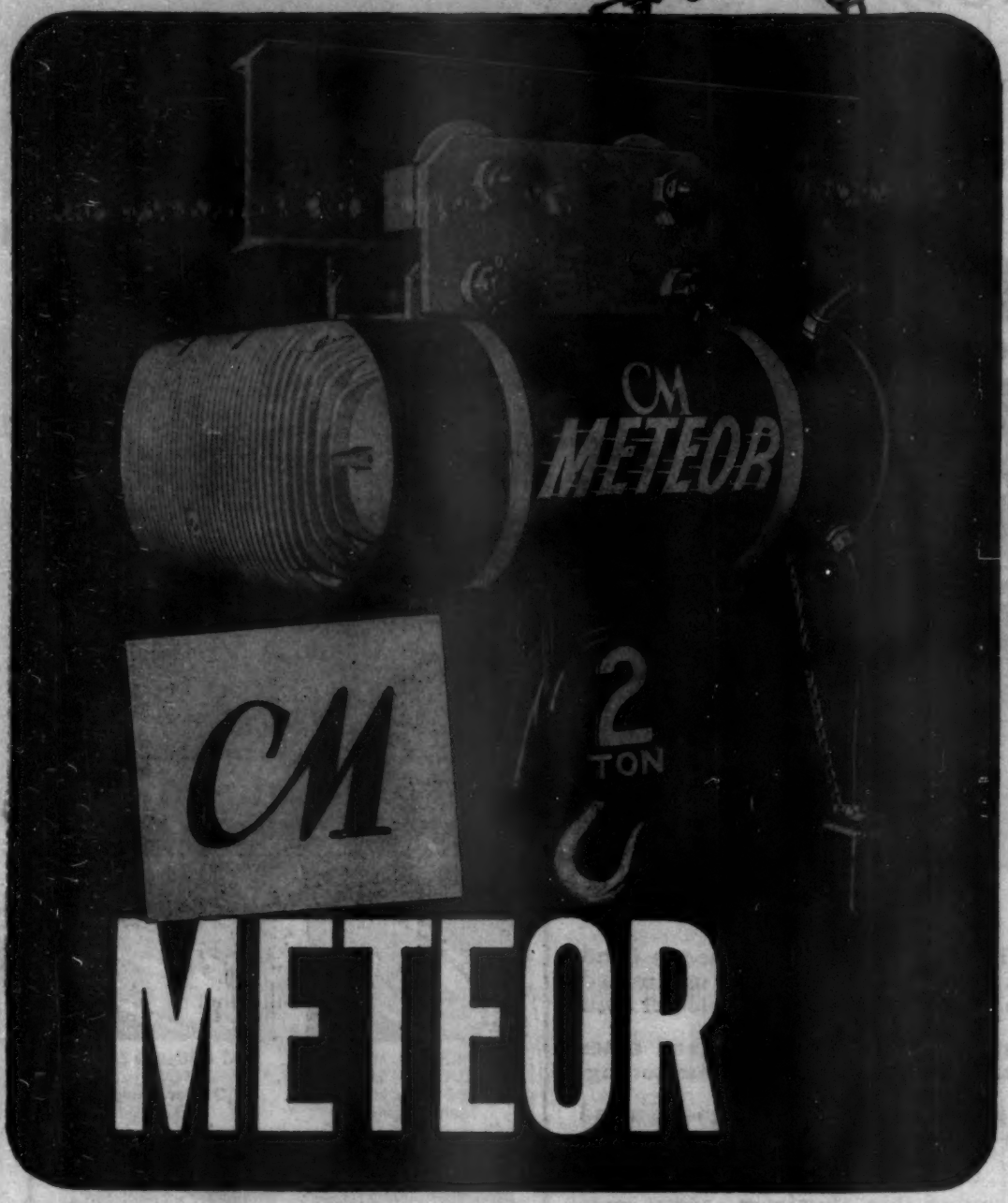
WHEN YOU USE SIMONDS YOU STAY IN THE HIGHLANDS . . . OF CONSISTENT CUTTING EFFICIENCY

Watch this Electric Hoist cut handling costs





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foodstuffs, maker states. American Aerovap Inc., 170 West 74th St., New York 23.

BOOKLETS. "Communist Infiltration in the United States," 40 pages, two editions, 10c and 25c. "Communists Within the Government," 56 pages, 50c. "Communists Within the Labor Movement," 60 pages, two editions, 25c and 50c. Quantity prices on all. Economic Research Dept., Chamber of Commerce of U. S. A., Washington 6, D. C.

PORTABLE DICTATING UNIT. Time-Master records on endless plastic belt which can be mailed. Belt holds 15-minute dictation. Electronic Dictaphone weighs less than 20 pounds. Size, 4½x9½x12½ inches. Carrying case available. Dictaphone Corp., 420 Lexington Ave., New York.

PLASTIC. Tenite II (cellulose acetate butyrate) is crystal clear. For applications where near-optical clarity is required. Tennessee Eastman Corp., Kingsport, Tenn.

FILMS

Grinding and Use of Basic Lathe Tool Cutter Bits, third in series on lathe operations. Color, sound, 16mm., 800 feet. Free loan or purchase basis. South Bend Lathe Works, 298 East Madison St., South Bend 22, Ind.

Label-Dri depicts operation of labeling machine that applies labels to bottles without glue. Sound, 16mm. New Jersey Machine Corp., 1560 Willow Ave., Hoboken, N. J.

Your Stake in Collective Bargaining. Slide film, 35 mm., 51 frames. Complete with script, pamphlet. Fee, $2.50. Public Affairs Committee, Twentieth Century Fund, 22 East 38th St., New York 16.

Pigs and Progress, color, sound, 40 minutes. Shows how aluminum is fabricated, and recent applications. Reynolds Metals Co., 2500 South 3rd St., Louisville 1.

Index of Training Films, guide to motion pictures and slide films available for industrial training use. Second edition. Over 2000 references. Eastman Kodak Co., Rochester, N. Y.

Unfinished Business. Describes progress since V-J Day of U. S. Steel's multi-million dollar construction and modernization program. United States Steel Corp., 71 Broadway, New York.

$725.00

Complete with Motor and Switch
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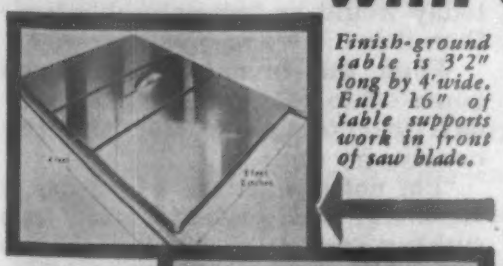
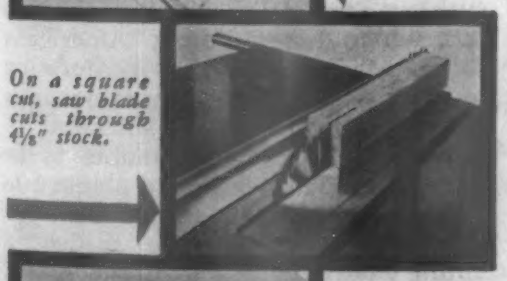
Low-cost DELTA® 12" Tilting-Arbor Saw

with a 4⅛" cutting capacity



Finish-ground table is 3'2" long by 4' wide. Full 16" of table supports work in front of saw blade.



On a square cut, saw blade cuts through 4⅛" stock.

Saw blade tilts to right full 45°; Cuts stock 2⅞" thick at 45° tilt.

Does many jobs in your maintenance department — and other places:

- Straight ripping
- Cut-off work
- Compound angular cutting
- Angular cutting
- Rabbeting
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- Dadoing
- Shaping

It's got plenty of power — this new Delta 12" Tilting-Arbor Saw. You can use a 3 HP or 5 HP motor. Four V-belt drive (with motor and arbor on a common cradle) gives this machine a positive drive.

The distance from floor to table surface is 34". The saw guard is super-safe. The miter gage runs in a T-slot, so that it can't fall off the table. All controls are easy to work and easy to set for accuracy. One lever locks the rip fence at both front and back. Fence can be adjusted to micrometer exactness. Arbor is carried on lubricated-for-life ball bearings.

Your nearby Delta distributor can give you further details on the economy and versatility of this new Delta 12" Tilting-Arbor Saw. See him. Look for his name under "Tools" in the classified section of your telephone directory.

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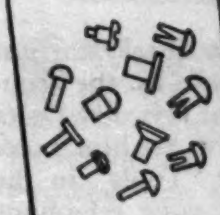

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THEY SAY AND DO

Suggestion Plans Yield Big Savings

CHARLES H. HALL, Secretary, American Surety Company, speaking before National Association of Suggestion System

Introduction of employee-suggestion systems in the last two to five years has saved 40 business organizations throughout the country from $1100 to $1,100,000.

A large number of companies reported savings between $30,000 and $60,000 during any one year. There were a number of companies whose annual savings ran into hundreds of thousands of dollars. The percentage of suggestions approved varied all the way from 8.2 per cent to 42.2 per cent, with an average of 27.3 per cent. Total awards paid during 1947 ranged from less than $1000 to approximately $150,000, and the majority of companies reported average awards between $15 and $25.

Many Companies Bar Older Job Seekers

The State of New York's Joint Legislative Committee on Problems of the Aging announced recently that a survey had revealed that 39 per cent of the companies queried had formal rules barring hiring of older workers.

According to the survey, the bulk of age discrimination was practiced by large companies, although the policy is seeping down to medium-sized plants.

The largest percentage of older workers was found in companies with one to ten employees, although railroads, textile, piano, and small food canning companies also hired large numbers of older workers.

Among the reasons for the age-hiring policies were (1) the belief that workmen's compensation rates increased when elderly persons were employed; (2) the high cost of hiring older workers under pension plans; and (3) the widespread opinion that older workers could not produce as profitably as younger workers.

Thomas Edison and Free Enterprise

HON. ALBERT W. HAWKES of New Jersey speaking in the Senate of the United States

Let us consider for a moment what would have happened to Edison had he lived in a communistic, socialistic, or policed state, toward which we, for the past 16 years, have drifted under the guise of liberalism.

It would have been necessary for Edison to have gone to the Bureau of New Ideas of the Division of Engineering of the Department of Inventions of the Office of Social Improvement for permission to use rare and essential commodities in his experiments to produce an electric light.

It would have been necessary for Edison to have revealed his educational qualifications.

Edison had no educational qualifications. He never attended college. His school teacher judged him addled and sent him home as a moron to be cared for by the state. A loving mother, who herself at one time was a school teacher, laid the basis for his great success. What possible justification would there have been for a bureaucrat to have assumed that Edison could invent an electric light, much less the phonograph and moving-picture machine, to say nothing of the alkaline storage battery?

Edison would have been denied the use of essential materials for his experiments. There would have been no experiments by Edison. There might have been no electric light, no phonograph, nor the 1100 other inventions now claimed by the communists as being Russian-born. These inventions helped to make the world a better place in which to live. Instead of bringing light, warmth, and joy to the world, Edison's ambition and initiative—the mainspring of America—might easily have been killed by the deadening hand of government control.

We, the beneficiaries of the efforts of Thomas Alvin Edison, should thank God that he did not live in a communistic, socialistic, or a policed state. If he had, our living standard today would be immeasurably lower than it is . . .

When the inventor took a few hours off to celebrate his 73rd birthday, in referring to the labor monopoly, he said:

"I'm not against the 8-hour day or anything that protects labor from ruthless employers, but it makes me sad when I see young Americans shackle their abilities by conforming to rules which force industrious men to keep in step with the shirkers.

"It used to be fashionable to be ambitious. The employee planned to become an employer; the unskilled man sought to become skilled; a young man was not well thought of in his community if he was not striving for a higher place in life.

"I'm wondering what would have happened to me if 50 years ago some fluent talker had convinced me that it was not fair to my fellow-workers to put forth my best efforts.

"If my life had been made up of 8-hour days, I do not believe I would have accomplished very much. If the founders of our republic had been afraid they might earn more than they were paid, this country would not amount to as much as it does."

Edison's experiments were carried

How industry makes multiple savings with Gulf Quality Oils and Greases:

Cutting machining costs for

JET PLANE PARTS

of new tough nickel alloy

TOUGH, heat-resisting Inconel X — a new nickel-chromium alloy—is ideal for certain jet plane parts. But it's extremely difficult to machine.

A New England plant found it necessary to regrind tools after machining only eight bolts of this metal—working on a jet plane parts contract.

After a number of different cutting oils were tried without improvement in machining practice, a Gulf Lubrication Engineer was brought into the picture. His recommendation: Gulf Stainless Cutting Oil B. Result: As many as 150 bolts before it is necessary to regrind tools. Production increased, costs down!

Says the plant Superintendent, "Use of Gulf Stainless Cutting Oil B is the difference between a profitable contract for us and a substantial loss."

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Glass Sand. Equal in chemical quality to any in the United States and used by glass plants in Oklahoma and adjacent states since 1913.

Tripoli. This state has long been an important supplier of tripoli, in 1944 ranking third in national production.

Novaculite. Outcroppings of more than 100 square miles in southeastern Oklahoma are a continuation of the outcrops in southwestern Arkansas where novaculite has been produced for many years and where chemical analysis shows silica content to be 99% or more.

Vein Quartz. Very large deposits of milky variety are easily accessible.

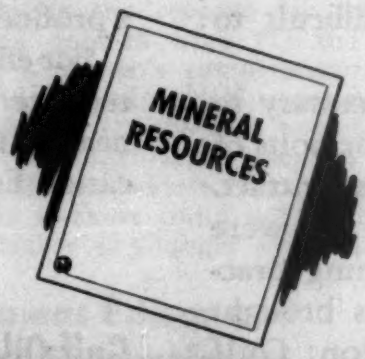
Chat and Slimes. Millions of tons of highly silicious material are available as by-products of zinc mining in northeastern Oklahoma.

TYPICAL ANALYSIS OF SILICA GLASS SAND FROM ARBUCKLE MOUNTAINS

Average of Plant Run — 1947

SiO_2	99.829
Fe_2O_3	0.036
Al_2O_3	0.072
CaO	0.009
MgO	0.005
L. O. I.	0.072
Total	100.023

Detailed information on Oklahoma's mineral resources is available on request, based on data by the Oklahoma Geological Survey. Map showing location of mineral deposits is also available.



THEY SAY AND DO (continued)

on a free economy for the benefit of humanity. Controlled and unhampered by the "all-wise" planners, Edison perfected his inventions and put them into production without kowtowing to overbearing labor czars, without appearing before arrogant labor boards, and without approval of all-powerful bureaucrats.

Edison puttered away on his own. He often lost, but never asked the taxpayer, through his government, to subsidize his efforts or to underwrite the cost of his failures.

Is Free Enterprise All Wrong?

(Reprinted here is Trundle Talk No. 114, by George T. Trundle, Jr., president, The Trundle Engineering Co., Cleveland)

Said the *London Sphere*, some time ago: "The U. S. has 6 per cent of the world's area and 7 per cent of its people. It has 60 per cent of the telephones, 80 per cent of the motor cars, 35 per cent of the world's railroads. It produces 70 per cent of the world's oil, 60 per cent of wheat and cotton, 50 per cent of copper and pig-iron, 40 per cent of coal and lead. It has $11 billion in gold. It has two-thirds of the world's banking resources. The purchasing power of its people is greater than that of all the people of Europe or all the people of Asia."

And yet, as the *London Sphere* commented in amazement, in the face of this record of accomplishment there are some people in the United States who claim our "free enterprise" system is "all wrong, ought to be abandoned, must be discarded, and the time has come to substitute political management for individual initiative and supervision."

What this London paper can't understand is why, if this system has got us more than any people any place in the world, some of us now want to get rid of it.

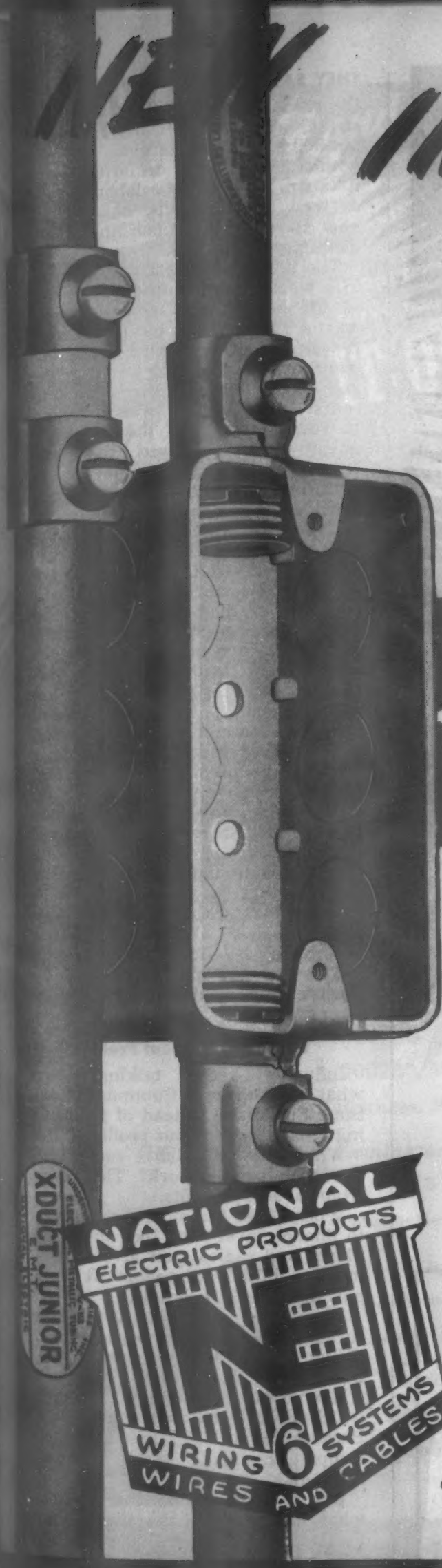
Neither can I understand it. It doesn't make sense.

What started all this fuss about our "free enterprise" system? Does it all go back to Karl Marx?

I don't think so. I think it started chiefly because a lot of people, for various reasons. wanted a whipping boy—and picked on industry for that purpose.

It started with the 1929-33 depression. Politics blamed "big business" for it. And the people identified big business with industry. Sure, industry was *partly* to blame. But so were brokers and bankers. So was the public who speculated in stocks. So were the people who engineered real estate booms. So were the housewives who overbought on the installment basis. So were the farmers who went land crazy. But it was industry that took the public whipping.

No sooner were we getting out of the depression than along came



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. . . IN BRONZE GATE VALVE DESIGN

LUNKENHEIMER

200 LB. BRONZE *UNION BONNET* GATE VALVE

The new Lunkenheimer 200 Lb. Bronze Union Bonnet Gate Valve incorporates the first application of full cylindrical body sections in bronze gate valves. This construction, previously used only in higher pressure steel valves, provides great strength and maximum resistance against distortion of the valve body and seats due to internal pressure strains and other stresses. Tests made under the most severe conditions prove that this design will not distort and will maintain initial proportions and seat tightness.

In addition to the cylindrical body construction and other service-giving features, these valves employ Lunkenheimer's patented Alloy Stems which eliminate stem thread failure due to wear.

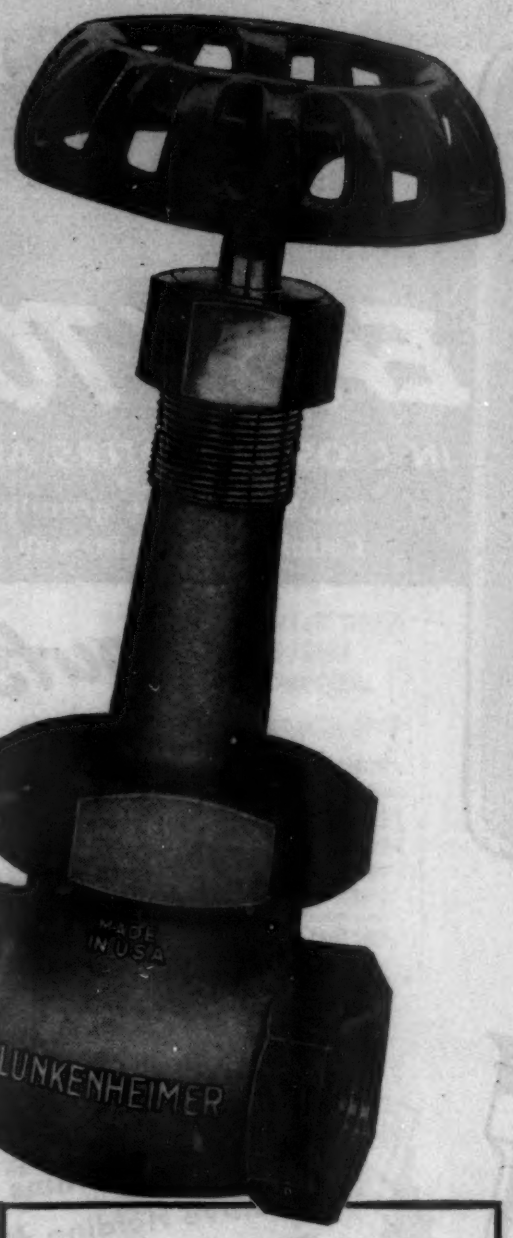

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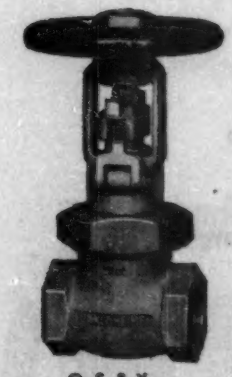
Fig. 2228—Screw Ends

Fig. 2229—Flange Ends

Double Disc

Rising Stem



O. S. & Y.
Union Bonnet
¼ to 2 inches
Fig. 2232 — Screw Ends
Fig. 2233 — Flange Ends
Wedge Disc, Rising Stem

Union Bonnet
¼ to 2 inches
Fig. 2230 — Screw Ends
Fig. 2231 — Flange Ends
Wedge Disc, Non-rising Stem

Complete information is given in Circular No. 534. Ask your Lunkenheimer Distributor for a copy or write us direct.

the sit-down strikes, the Little Steel strike, etc., with all the attendant publicity about "enormous" profits, with the New Deal declaring "profit" a sin. By that time labor leaders, as well as politicians, had learned how to capitalize upon the public damning of industry.

The next thing we knew we were in a war, with industrial production as the key to the whole business. Again, industry was put on the spot. It was blamed for higher prices that were caused, in fact, by war scarcities and war financing inflation. Of course, price control was necessary. It wasn't because of the sins of industry—it was because of the war. It covered many fields besides manufacturing. But the public was led to consider industry as the big bad wolf against which they were being protected by government.

Well—we won the war. Two groups came out of the war with more power than they ever had before. Those groups were organized labor and government.

The labor leaders and the New Deal bureaucrats didn't want to lose their special power and position. They had made their "gains" largely by damning industry. How could they keep them? Well, people's imaginations were captured by the Russian experiment in Communism and the British experiment in State Socialism. There had already been established in many people's minds the idea that "profits" were bad. So how about attacking the whole profit system? How about saying "free enterprise" is all wrong?

This has put industry on the defensive; and I think it is using the wrong defense.

"What's *Right* About Profits?"

Industry keeps talking about what's *wrong* with Communism and State Socialism, instead of proclaiming what's *right* about profits.

Where do the plants come from in which people work? They come from saved-up profits.

Where does the money come from to finance inventions like autos, airplanes and radios, that give employment to millions of people? It comes out of saved-up profits.

How come people can get life insurance? It's because insurance companies invest money in enterprises that operate at a profit.

How come people have banks in which they can keep their money? Because banks lend this money to companies and to people who use it to make a profit.

Under our competitive system, what companies make profits over the long run? Those that succeed in offering more people better things at lower costs.

In a company that makes money, people *keep* jobs; in a company that loses money, people *lose* jobs.

Profit is the basic key to steady

Remington Rand

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WATCHMAKER PRECISION characterizes every phase of Remington Rand's activities . . . PRECISION in advarced engineering . . . PRECISION in manufacturing hundreds of thousands of intricate assemblies to serve the world's business.

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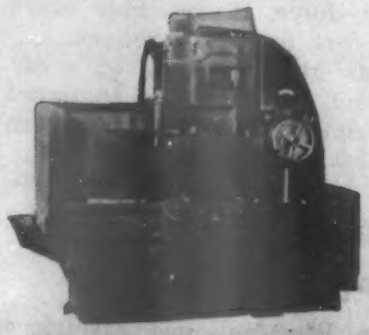
THE JOB: **GRINDING BOTH SIDES OF PRINT WHEELS — TO LIMITS ±.00025". Material is No. 1010 Steel — 2.660" diameter x .100" final thickness. Stock removal per side is .009" to .013".**

THE METHOD: ***Remington Rand Engineers chose a No. 18 Blanchard Surface Grinder*** **. . . 113 print wheels are simply and quickly placed on the 36" magnetic chuck. . . .**

THE RESULT: ***which of course governed the choice of the most suitable machine*** **. . . two chuckloads or 226 accurately sized pieces (452 surfaces) per hour. Difficult grinding jobs are made simple with Blanchard Grinders.**



Whether your flat surface grinding job is simple or seemingly difficult, Blanchard Engineers will gladly assist you in arriving at the most profitable solution. Avail yourself of this free, non-obligatory service.

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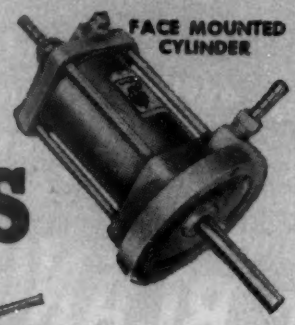
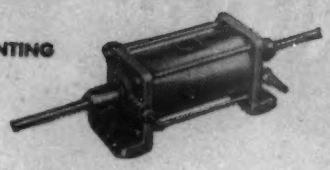
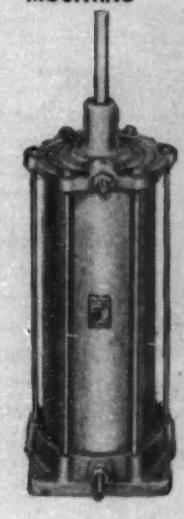


HORIZONTAL MOUNTING



SUSPENDED OR SWIVEL MOUNTING

VERTICAL MOUNTING



Mounting	Bore			
Horizontal 1½"	2¼"	3"	4"	5"
Vertical	2¼"	3"	4"	5"
Face	2¼"	3"	4"	5"
Swivel	2¼"	3"	4"	5"

Length of stroke optional

The new Mead Air Power Catalog shows the full line of single and double-acting cylinders, and air-operated Presses, Vises, Chucks, Hammers, Work Feeders—for faster, money-saving production. Write!

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have both—

FREE LIFT of 55" with an overall height of only 83",

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work and a higher standard of living. That s the nub of the whole "free enterprise" system.

Only when man's genius for profit went into partnership with engineering—in research, invention and manufacture—were men and materials, the raw stuff of nature, converted into civilization.

Why don't we sell our own system instead of damning our competition?

There's nothing wrong with the system. What makes trouble is when somebody throws monkey wrenches into the machinery and stops it from operating.

The whole key to our system is increased productivity. Anything that increases productivity, *cuts* costs. Anything that slows down, or stops productivity, *increases costs.*

What happens when there is a strike? Production stops cold—but costs go on. Overhead, interest, office salaries, insurance, taxes, and other expenses continue. All these costs eventually have to be added to the price of the product. Who pays? Everybody—including the strikers, themselves. And suppose management grants the wage increase rather than risk the added cost of a strike? Wage costs go up—and again, everybody pays.

When government lays down regulations that hamper production, government slows down the whole system; and sooner or later, everybody pays the price. What many people fail to understand is that organized labor on the one hand, or government bureaucracy on the other, can secure special group privileges only at the expense of all the rest of us.

When management makes a bad decision—in poor design, or faulty merchandise, or unsound financing, and the result is idle facilities, management has likewise thrown a monkey wrench into the machinery; but competition takes care of *that.*

Competition puts such management out of business.

What's wrong with our "free enterprise" system? *Nothing*—if we'll quit throwing monkey wrenches and settle down to see *how much and how fast we can produce.*

How about aiming at a car that will sell for under a thousand dollars, and a new house you can buy for less than ten?

Technical Know-How Being Exported

The Westinghouse Electric International Company is exporting technical know-how. Phase 1 of this program is nearing completion. Some 220 young Mexican and Chinese engineers have already completed an intensive work-learn training course in Westinghouse plants throughout

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Countless manufacturers in the automotive, aircraft, radio, appliance, electrical and many other industries are using the SPEED NUT brand of fasteners . . . to reduce assembly time and cost . . . to improve product quality.

SPEED NUTS can cut *your* assembly costs, too, because they can be applied faster . . . they eliminate assembly operations, such as welding, clinching, riveting . . . and, in many cases, they combine several parts into one.

Tinnerman engineers are prepared to show you how SPEED NUT fasteners can be profitably applied to your product. Ask about this fastening analysis service now. Also, write for copy of the latest SPEED NUT bulletin. TINNERMAN PRODUCTS, INC., 2038 Fulton Rd., Cleveland 13, Ohio.

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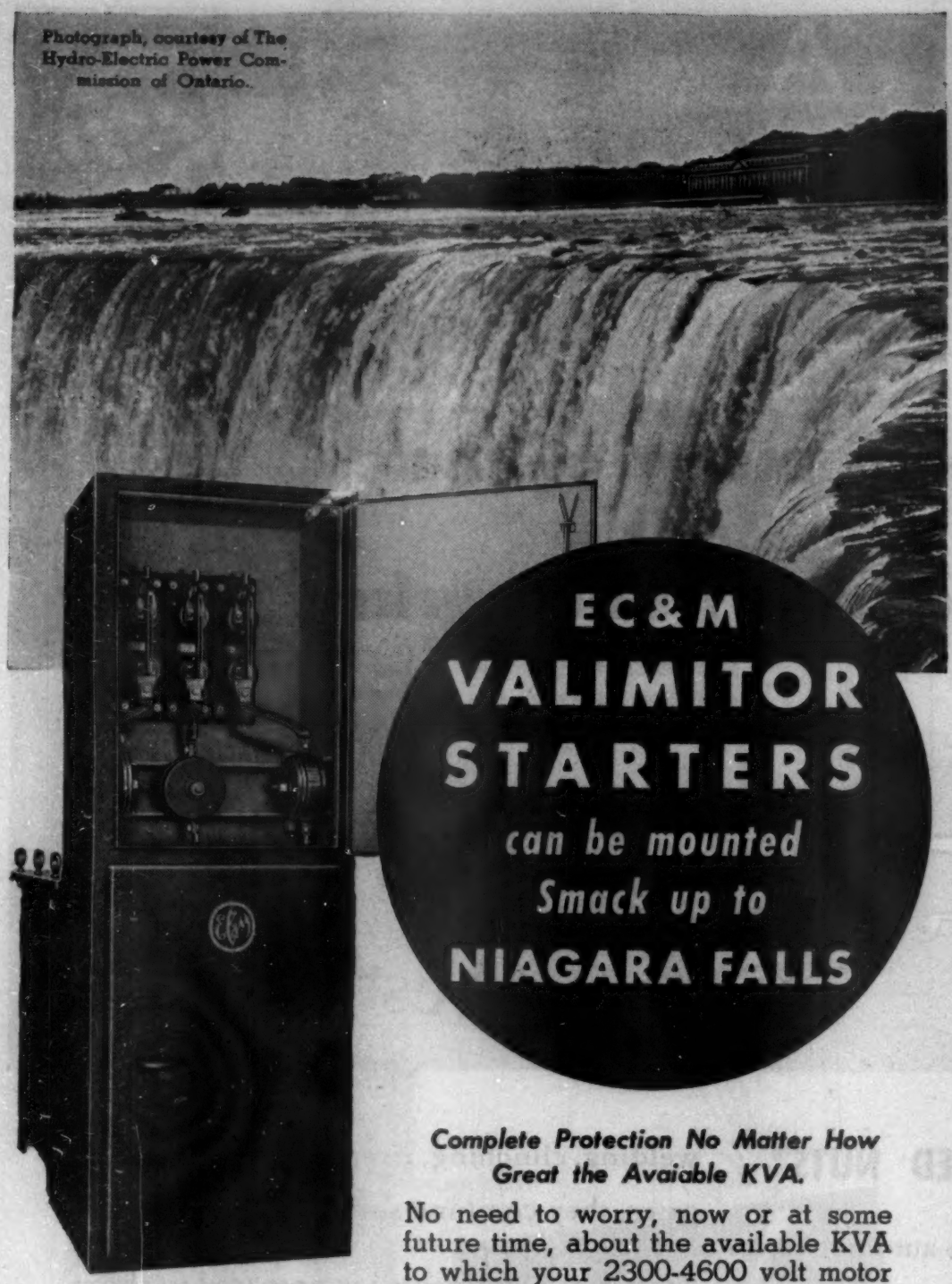
FASTEST THING IN FASTENINGS

MORE THAN 4000 SHAPES AND SIZES



Complete Protection No Matter How Great the Avaiable KVA.

No need to worry, now or at some future time, about the available KVA to which your 2300-4600 volt motor drives may be subjected. EC&M VALIMITOR Starters give *permanent* protection—*nothing* to replace—*no change* later on, even if present capacity is increased.

MAXIMUM RATINGS

2300 volts		4600 volts
600 HP	60 cycles	600 HP
300 HP	25 cycles	250 HP

As the name VALIMITOR (volt-ampere-limitor) implies, these Starters are designed to limit the maximum possible fault current to 25,000 KVA (steady state), even when connected to a system having infinite available KVA. The well-known Type ZHS Magnetic Contactor, having 50,000 KVA interrupting capacity, is more than adequate for the interruption of such faults, including any initial, short-time transients. Because of inherent impedances of any system, the actual possible fault currents will be further restricted. Irrespective of this, however, the electromagnetic forces and thermal effects under a fault condition are limited by VALIMITOR Starters to safe values.

EC&M VALIMITOR Starters can be applied without analyzing the system for maximum available KVA at the point of application. Simply tell us the HP, voltage, phase and frequency of your motors, and whether squirrel-cage, wound-rotor or synchronous type.

E&M

THE ELECTRIC CONTROLLER & MFG. CO.
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the nation. Phase 2, lending technical assistance in building and operating new electrical manufacturing plants in both Mexico and China, is well under way.

In addition to such programs in countries like Mexico and China, where new manufacturing plants are being established, Westinghouse also has been training specialists and giving other technical assistance to countries where existing facilities are being expanded and plants destroyed by war are being reconstructed. These countries include Holland, England, Italy, Belgium, Norway, and Australia.

Similar to the kind of assistance that the European Recovery Program will make possible, these projects are designed to help countries in this latter group catch up on the many engineering ideas and techniques that have been developed in recent years for peacetime manufacture.

Military Leave Policies in 1000 Companies

Definite military leave policies have been adopted by more than 85 per cent of nearly 1000 companies surveyed by the National Industrial Conference Board. No policy has been determined in many of the remaining companies because none or only a few of their employees are members of the National Guard or a reserve unit of the Army, Navy, Marines, or Air Forces.

The Board surveyed the military leave policies for salaried employees in 466 companies, and for hourly workers in 445 others.

1. **Military leave for salaried employees.** Of the 380 companies that have formulated definite policies, about half permit time off for military training in addition to regularly scheduled vacations.

2. **Military leave for wage-earners.** In the 407 companies where military leave policies exist for hourly workers, the great majority do not grant leaves of absence in addition to the vacation allowance.

3. **Size of company as a factor.** Most of the cooperators that do not grant additional time off for military training are small companies. For example, among the 106 companies with fewer than 250 employees, only nine grant time off to hourly workers. But 26 of the 32 companies with more than 5000 companies grant additional time off.

4. **Length of leave granted.** This survey reveals that the length of military leaves varies from one week to one month. Among the cooperating companies, the two most prevalent leaves of absence periods are two weeks and fifteen days. Some companies have set no maximum leave time and indicate that leave is granted for "the time required."

5. **Compensation practices — salaried employees.** Of the companies

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ONLY 83" HIGH WITH FORKS LOWERED

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up to 48" load length

2500 LBS.
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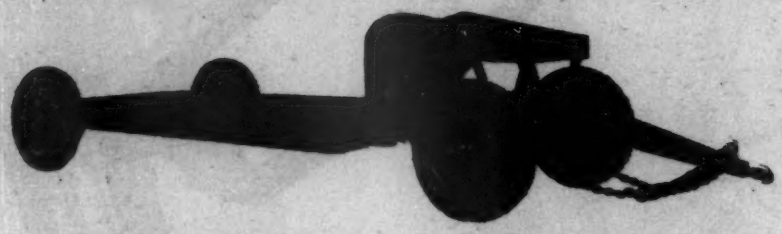

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Capacity 5 tons . . . Underslung steel frame. Safety plate, steel deck. Model shown equipped with pneumatic tires. Also available with solid rubber tires. Wheels mounted on Timken type roller bearings. This and all other Mercer Trailer Trucks (All types—all capacities)—designed by engineers whose reputation is founded upon doing things right. Literature available. Inquiries invited.

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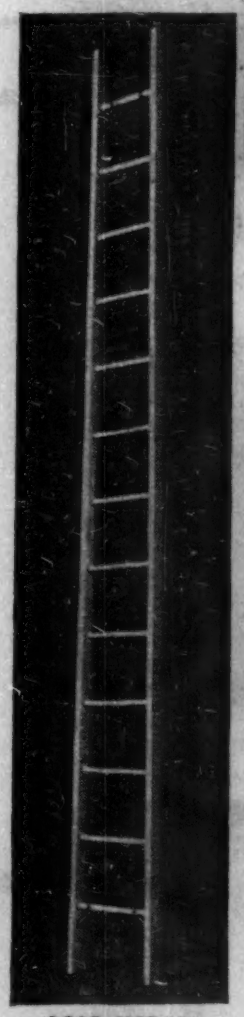

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Designed with broad working platform. Platform heights of from 3' to 18'

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- Safety Single, Extension, Step and Platform Ladders

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having a pay policy for salaried employees in the National Guard, about one-third make up the difference between the governmental compensation (if less) and the employee's regular salary.

6. **Compensation practices—hourly workers.** About 40 per cent make up the difference between the worker's active duty training pay and his normal company earnings. Over half grant time off for training, but give no company pay to the worker while he is training. A few companies grant full company earnings while the worker is on leave.

Management Must Sell Itself

AUSTIN S. IGLEHEART, President, General Foods Corporation, speaking before the New York Traffic Club

Within and without the business structure, people are not informed as to the real merits of our economic system—still less informed as to our own operations, aims, and views. Misinformation and untruths flourish where adequate information and truths are lacking.

Management has left open a wide hole through which its adversaries are driving half-truths and falsehoods.

Management must support its promise in keeping people informed by building up an affirmative faith in what management itself is doing.

1. Management is not doing a sufficient information job when 35,000,000 people (in the United States) remain unconvinced of the merit of the system,* and not when only one worker in five gets any facts at all about profits and wages.

2. Top management must support improved information to its employees until "every member of the team is asking questions and getting and giving answers."

3. Business heads must be frank rather than dispense half-truths or distortions of facts.

4. Management's story must be told so that the ordinary person can understand it. The use of business terminology must be brought down to earth in its true meaning.

5. Businessmen must not be afraid to speak boldly, and not be afraid to present their side of the question in controversial issues.

6. Management should "be willing to put time, effort, and money into the task of vindicating itself before a questioning public."

Do Fewer Patents Signal Stagnation?

The trend in applications for United States patents is headed downward. In a bulletin recently released by the Machinery & Allied Products Institute, this problem was brought into sharp focus. The bulletin notes a similar decline in Great Britain, and advances reasons for the decline

* From Opinion Research Surveys.

Industrial Eye Accident Costs UP 78½%*

SINCE 1939

Here's One Expense that Can Be Drastically CUT in these days of Rising Costs

When you buy a machine or tool today, you may pay *more* but you expect and you get *something* for your money. Not so with industrial eye accidents . . . they represent a TOTAL LOSS. In some industries, this loss can reach staggering proportions in terms of claims, medical aid, lowered employee morale, equipment mishandled by substitute workers and other visible and HIDDEN costs! Even if *your* plant may *appear* to have no eye accident problem, it will pay you to investigate what an adequate eye protection program can do for you and how reasonably it can be done. Ask your AO Safety Representative for the facts.

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BELT—heavy 18 gauge steel.

WIDTH—12 inches to 30 inches.

LENGTH—5 feet to 30 feet.

SPEED—Up to 50 feet a minute.

H.P. REQUIRED—½ to 2 horsepower.

LOAD LIMIT—(recommended) 50 lbs. per arm. This can be exceeded 50%.

PULLING LOAD LIMIT—1000 pounds.

ARMS—18 inch maximum length. Can carry a load up or down.

Now . . . a NEW way to raise production and employee efficiency . . . to cut unit cost and operating space! STEEL-PARTS new ELEVATING steel belt conveyor is unbeatable for sending parts or packages from floor to floor in a continuous flow . . . lifts packages up or down . . . loads or unloads at desired height. Incorporates all of the famous features of STEEL-PARTS standard models. Let STEEL-PARTS engineers make specific recommendations concerning your materials handling problems. Mail the coupon today!

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in the United States. It further sounds this grim warning: "Whether this indisputable decline in patent applications is a straw in the wind portending technological stagnation such as has overtaken Great Britain remains to be seen.

"The country, and capital goods manufacturers in particular, would have greater cause for optimism if there were a resurgence of inventive ingenuity which would be reflected in a sharp upward trend in patent applications."

Labor Looks at Public Relations

G. L. PATTERSON, General Counsel, United Rubber, Cork, Linoleum & Plastic Workers of America-CIO, speaking before Silver Bay Conference

From the point of view of labor, management has fallen into several bad practices:

1. It consistently condemns the agencies of employees which make collective bargaining possible, while at the same time professing to believe in the generally accepted principle and practice of collective bargaining. All blame and no praise is not conducive to peaceful collective bargaining and is not good for our democracy. Keep telling the unions they are bad and they are likely to prove your point. Give them praise and they will respond in kind.

If management were losing money in this post-war period, the opposition to collective bargaining might be understandable. The record shows that management is making more progress and more profits with the existence of unions than it did in periods when collective bargaining was less prevalent.

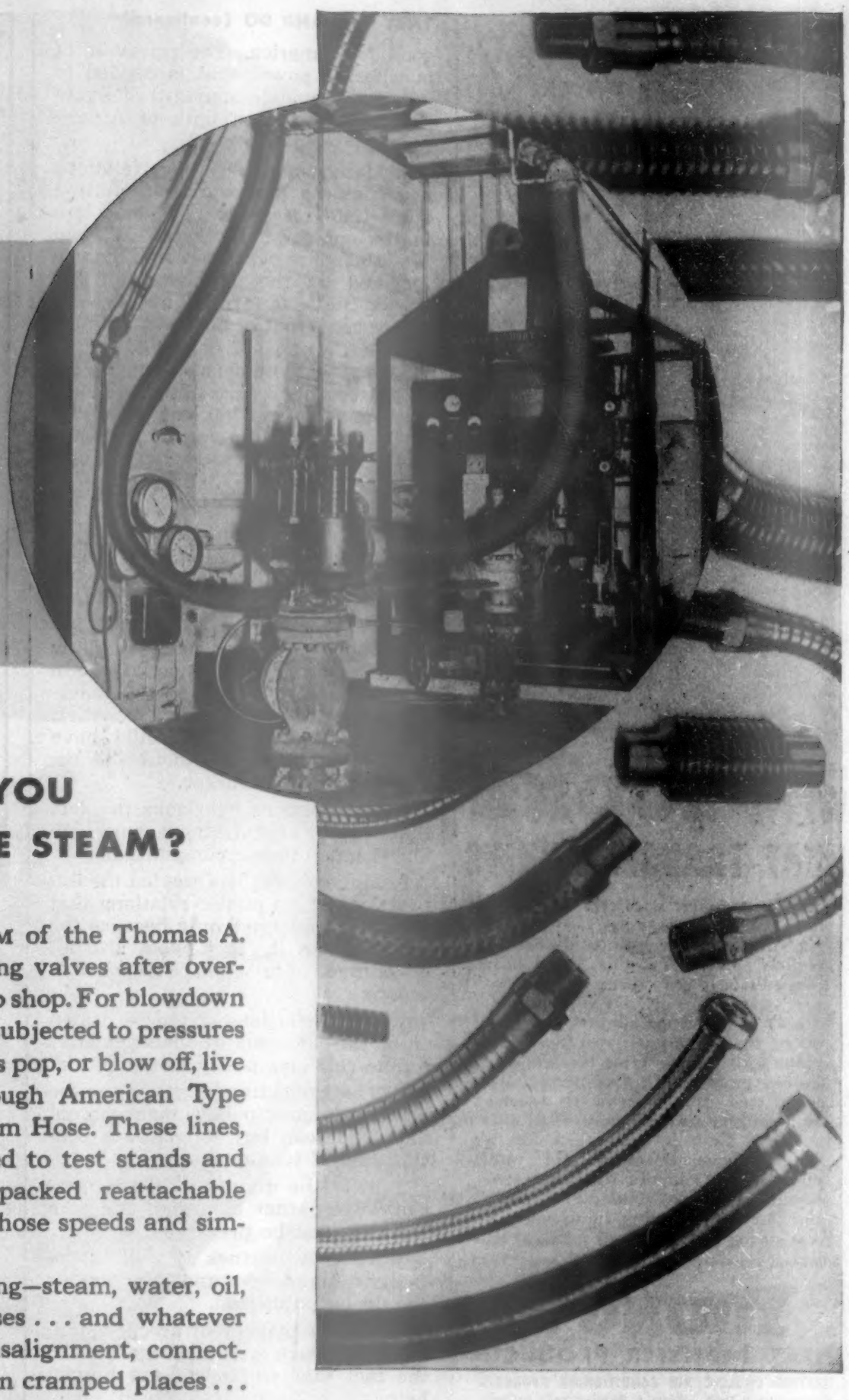
Management repeatedly accuses labor of not producing, of loafing on the job, and declares that high prices are the result. This is balderdash, for while management is setting aside great reserves and rolling up profits which exceed its expectations, it is ridiculous to accuse labor of not producing efficiently.

It is well known, too, that consumer buying power has been maintained only because of: (a.) The extension of consumer credit; (b.) the liquidation of past savings; (c.) the discontinuance of savings out of current income.

2. These storm signals which management does not recognize in public statements have a serious bearing on the welfare of wage earners.

3. Management has generally opposed legislation that is good for the worker and supported legislation that is bad for the worker. Labor wonders why. The working man feels that laws that are good for him are good for his country, and laws that are bad for him are bad for his country. What is good for the wage earner is good for business and is

When these valves POP



HOW WOULD YOU HANDLE THE LIVE STEAM?

THIS WAS THE PROBLEM of the Thomas A. Short Company in testing valves after overhauling in their San Francisco shop. For blowdown and pop-off tests, valves are subjected to pressures up to 600 lb. When the valves pop, or blow off, live steam is safely vented through American Type BD-15 Flexible Bronze Steam Hose. These lines, 3″ and 4″ I.D., are connected to test stands and rigid exhaust stacks with packed reattachable couplings. Flexibility of the hose speeds and simplifies the testing job.

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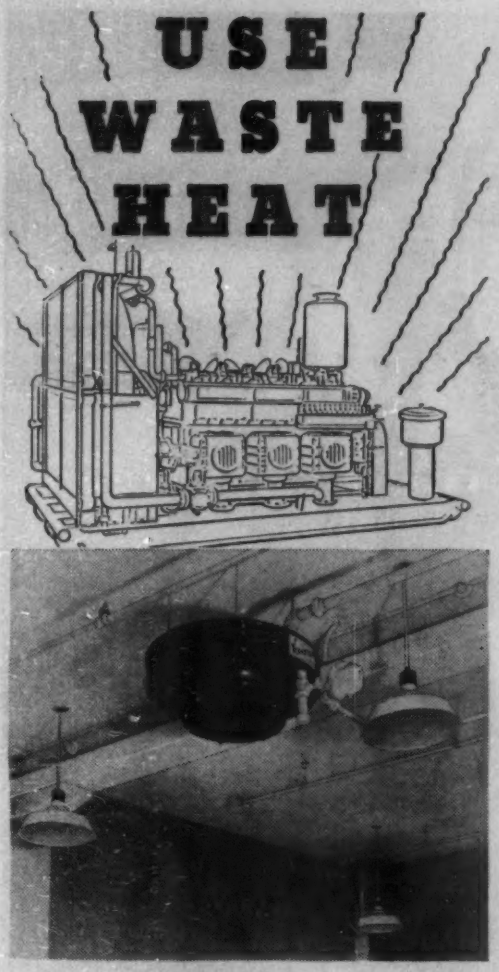

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THEY SAY AND DO (continued)

good for America. The reservoir of purchasing power that is needed to maintain our high standard of living lies with the great bulk of Americans, the wage earners.

4. Management's public relations proclaim that the worker is getting more than his share. The facts are to the contrary. Between 1945 and 1947 the share of the national income received by the population of the United States in farming increased to 36 per cent; that of business and professional groups, 35 per cent; that of wage earners and salaried employees increased only 5 per cent. In spite of this, management has put on a concerted campaign to show that wage increases have caused prices to increase.

5. Management objects to many benefit plans becoming subject to collective bargaining. For example, pension plans, life insurance, hospitalization, sickness and accident benefits.

6. Some companies refuse to allow the bargaining agent to participate in safety matters. It is hard to understand how management thinks their splendid safety records could have been accomplished without the cooperation of the worker.

7. Management overlooks the fact that labor organizations have reduced much unfair competition.

8. Management has created the impression by its public relations that unions are accepted only because the law requires it. Employees are not encouraged to join responsible unions.

What conclusions are to be drawn from this analysis of management's public relations policy and practice?

1. That collective bargaining is the best insurance policy management and labor can buy to insure a continuance of true democracy.

2. That the dignity of the American wage earner as a man and as a worker must be preserved.

3. That the virtues as well as the faults of employees and their unions should be publicized.

4. That management accept a philosophy which gives recognition to the fact that employees are human beings.

5. That management give recognition to the fact that the wage earner is not trying to injure his economy, but to improve it.

6. That unions are given credit where their conduct justifies.

7. That management support rather than oppose legislative programs which contribute to the welfare of the American working man.

8. That the wage earner be given the credit due him for his contribution to the standard of living which we enjoy.

9. That the wage earner be con-

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PREVENTS RUST ON NEW METAL

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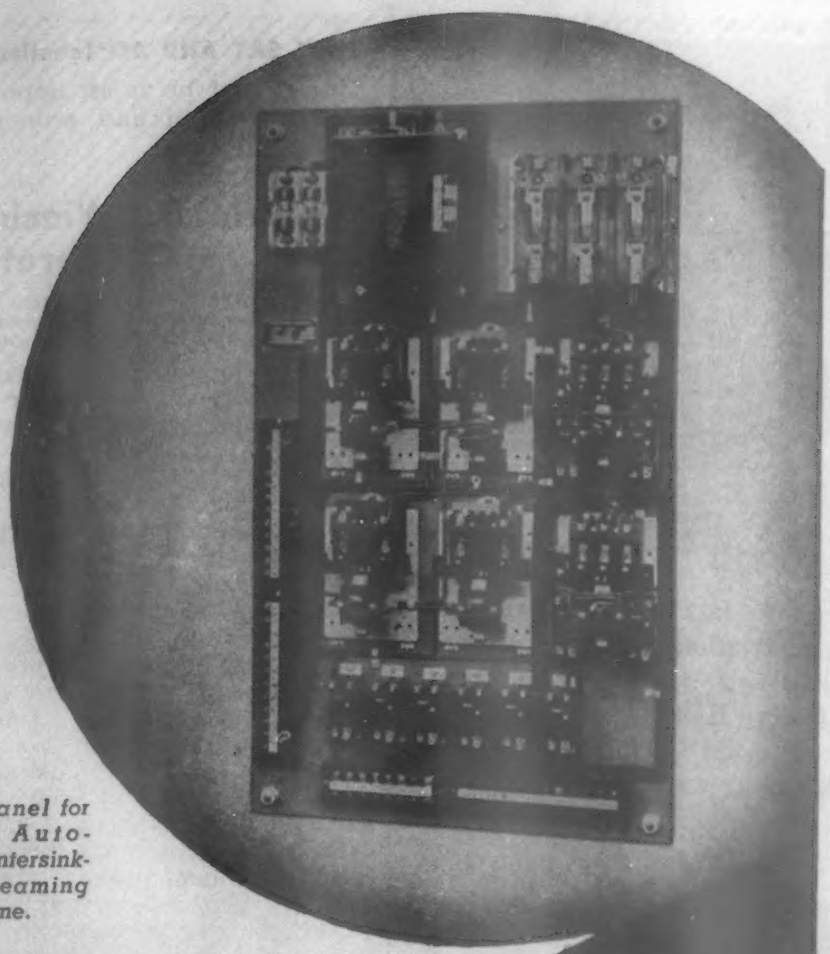
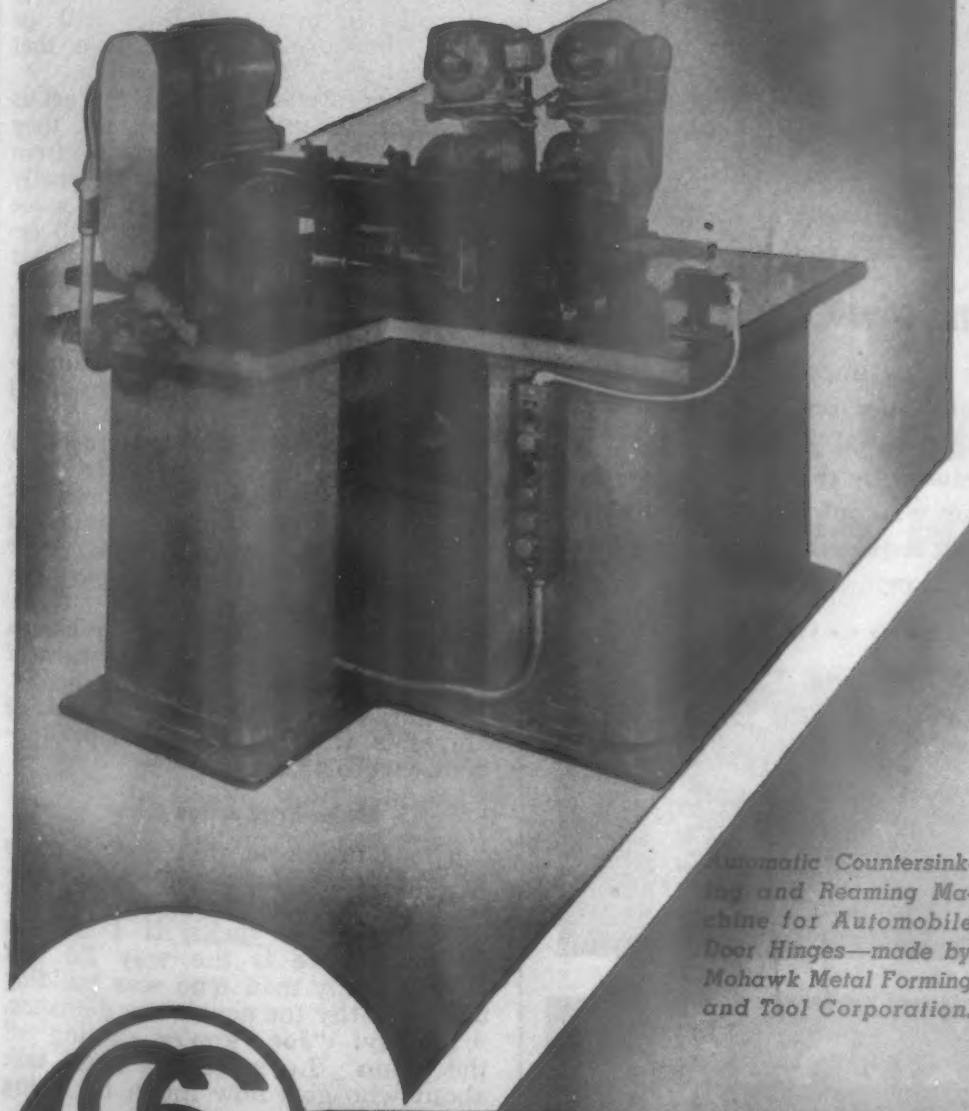


Control Panel for Mohawk Automatic Countersinking and Reaming Machine.



Automatic Countersinking and Reaming Machine for Automobile Door Hinges—made by Mohawk Metal Forming and Tool Corporation.

CLARK CONTROL helps speed production of automobile door hinges

This automatic countersinking and reaming machine made by Mohawk Metal Forming and Tool Corporation uses CLARK CONTROL for fast production of automobile door hinges.

1200 to 1400 hinges per hour are reamed and countersunk on this machine. Operation is entirely automatic—pieces are fed into a jig which delivers them to the machine, and they are not touched again until assembled.

The CLARK CONTROL is specially engineered to do the entire job—but each individual piece of apparatus on the panel is standard and the whole functions as a unit—through CLARK engineering "Know-How".

Builders and users of all types of machinery find CLARK CONTROL dependable, sturdy and requiring minimum maintenance.

Contact CLARK for Machine Electrical Control.

EVERYTHING UNDER CONTROL

THE CLARK CONTROLLER CO.

1146 EAST 152nd STREET, CLEVELAND 10, OHIO

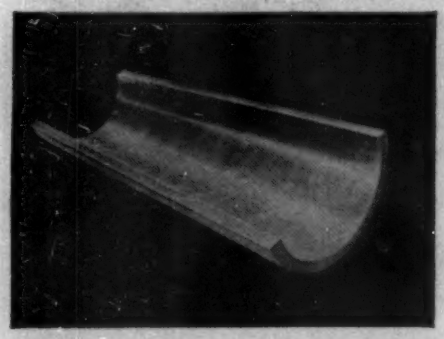
Which of these 4 TRANSITE* Advantages do you need in your water lines?

Fast Installation

Water lines go in fast when the pipe is Transite. The installation crew can lay more pipe per day because this pipe is light in weight, easily handled . . . and because Transite's factory-made joints are simply assembled on the job.

Tight, Flexible Joints

The Simplex Coupling, the standard coupling for Transite Pipe, was engineered to combine tightness with flexibility. Each joint in the line is a flexible "link" that helps the line absorb stresses and vibration, safeguards against leakage.



Maximum Flow Capacity

Transite Pipe has a smooth interior surface that offers minimum resistance to flow of water. And its initial high flow capacity cannot be reduced by tuberculating waters. This helps assure an ample volume of water for future plant requirements . . . helps keep pumping costs low.

High Corrosion Resistance

Made of asbestos cement, Transite Pipe is produced by a special process that develops maximum strength and exceptional corrosion resistance. Under corrosive conditions so severe that other pipe materials have been destroyed in months, Transite has given *years* of continuous service without deterioration.

For further information and engineering data about Transite Pipe, write Johns-Manville, Box 290, New York 16, New York

*Transite is a Johns-Manville registered trade mark.

Johns-Manville

TRANSITE PRESSURE PIPE

for Water Supply Lines • for Fire Lines • for Process Lines

vinced that he is an important part of the system and economy under which we live.

Blueprint For Winning Employee Cooperation

FRED G. CLARK, General Chairman, American Economic Foundation, speaking before the National Council of Industrial Management Clubs

Many labor disputes start because the hourly wage earner does not understand why company policy is as it is. There can be only two reasons: (1) Because management hasn't taken the trouble to tell it to the foreman; and (2) because the foreman hasn't taken the trouble to tell it to the worker.

Among all the groups in the economy whose influence with the worker is important, foremen stand second only to the labor union.

The foreman's job is to see that what the employer wants done—that is, what the customer wants done—is done at the production level. This is the most critical point in the management procedure, because the best policies are worthless if they are not carried out.

When every foreman has been equipped by top management to explain to the worker the ratio of payroll to profit, strikes will go down, because surveys prove that workers want this information.

To understand why workers act as they do, we must know what they believe to be true. We know from surveys that workers are usually conscious of the fact that at some point or another, customers will refuse to pay higher prices and at that point workers will be out of work.

But we also know that workers usually believe that wages could be substantially increased without increasing prices; that the raise could come out of profits.

In a recent poll 53 per cent of the workers criticized their companies for not supplying this information. To these workers dividends are something taken from their pockets and given to people who do nothing to deserve it. Their estimate of the size of dividends was between 25 and 50 per cent of all money coming into the company.

What would *you* do about wage demands if *you* thought that dividends were that high?

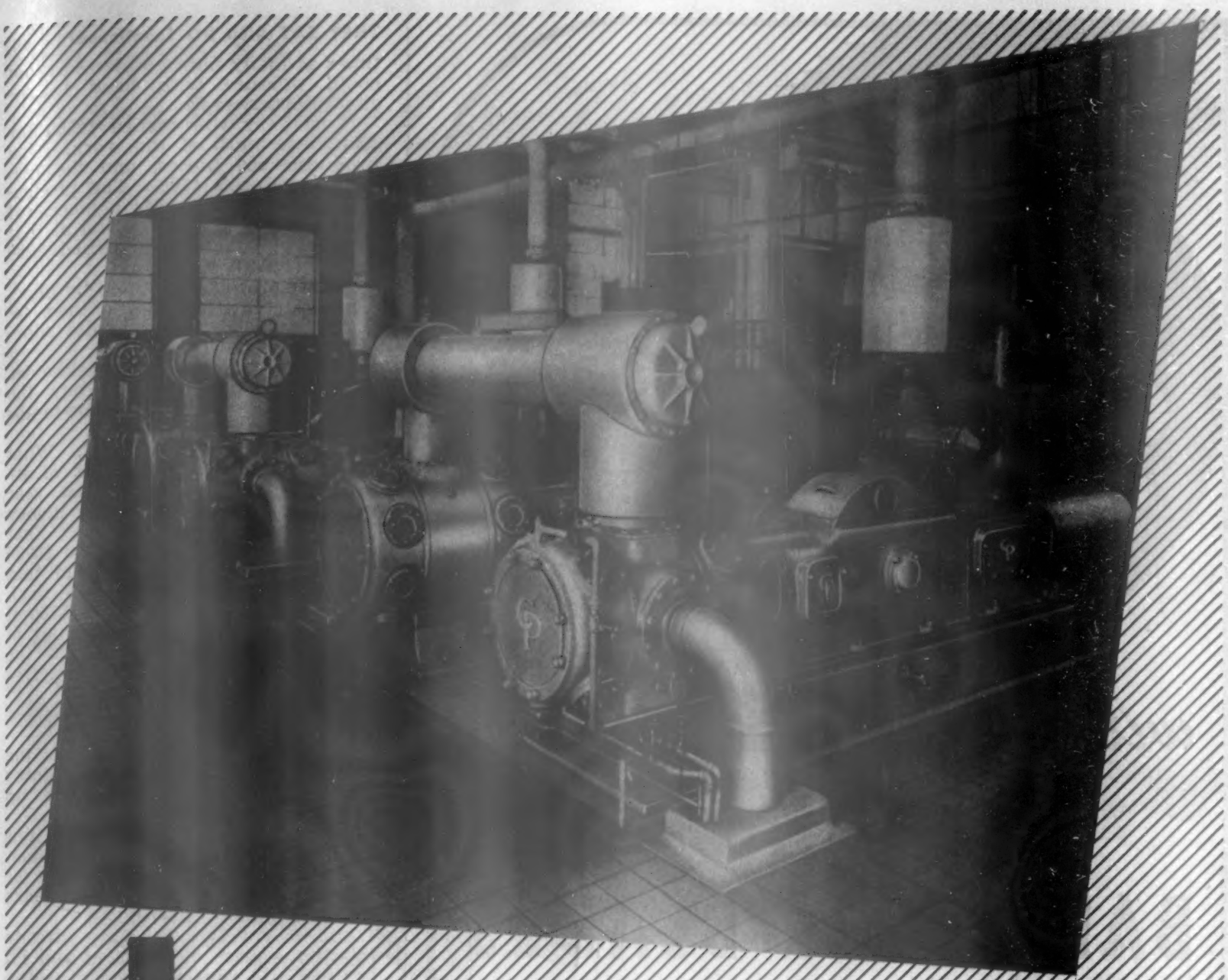
Make Economics Clear

The solution to this problem lies in making industry economics intelligible to the employee. To get down to brass tacks, if I were a foreman, here is the way I'd talk to one of my men who was building up sympathy for new wage demands.

I'd say: "Joe, you're getting off the beam. Let's have a little talk about who gets how much for doing what around here.

"Let's start with you. You work here 40 hours a week.

"The machine you use, plus its share of the floor and walls and the roof, cost $6000. That machine is the same as ten helpers put in here to work under your direction. That machine enables you to produce ten



Where Steam is Available . . . Type H Compressors

Where plant conditions favor steam drive, air demands can be met most efficiently with Chicago Pneumatic Type H Steam-Driven Compressors.

An economical steam end proportioned to user's steam conditions . . . automatic cut-off governor . . . and an efficient air end with Simplate Valves, and force feed lubrication throughout insure reliability and economy over a wide range of operating conditions.

Capacities range from 900 to 6600 c.f.m., 100 to 125 pounds pressure. Other sizes of CP Steam Driven Compressors are available in single and multi-stage design for lower and higher pressures.

Write for illustrated Bulletin 729.

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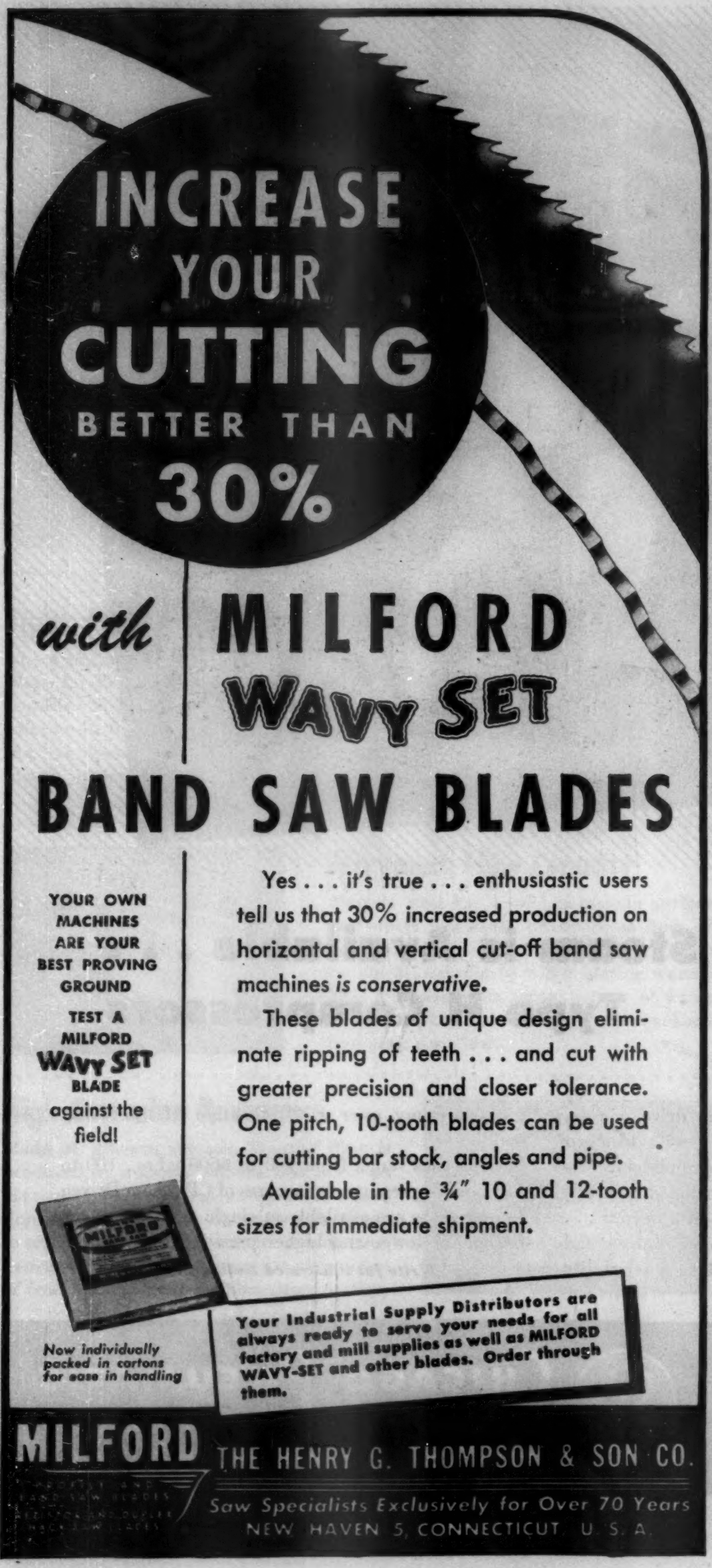
ELECTRIC TOOLS • PNEUMATIC TOOLS • AIR COMPRESSORS • ROCK DRILLS
DIESEL ENGINES • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES


INCREASE
YOUR
CUTTING
BETTER THAN
30%
with
MILFORD
WAVY SET
BAND SAW BLADES
YOUR OWN MACHINES ARE YOUR BEST PROVING GROUND
TEST A MILFORD WAVY SET BLADE against the field!
Yes . . . it's true . . . enthusiastic users tell us that 30% increased production on horizontal and vertical cut-off band saw machines is conservative.
These blades of unique design eliminate ripping of teeth . . . and cut with greater precision and closer tolerance. One pitch, 10-tooth blades can be used for cutting bar stock, angles and pipe.
Available in the ¾" 10 and 12-tooth sizes for immediate shipment.
Now individually packed in cartons for ease in handling
Your Industrial Supply Distributors are always ready to serve your needs for all factory and mill supplies as well as MILFORD WAVY-SET and other blades. Order through them.
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THE HENRY G. THOMPSON & SON CO.
Saw Specialists Exclusively for Over 70 Years
NEW HAVEN 5, CONNECTICUT U. S. A.

times as many finished pieces as you could produce with hand tools—about 5000 a year.

"Last year you earned $2500 for doing one-tenth of the work. You produced 500 pieces, and the machine produced 4500. The production cost was 50 cents a piece. If you had done them by hand at that cost, you would have earned $250 for the entire year.

"But you didn't do them by hand. You and the machine did them together and the machine did nine-tenths of the work.

"In other words the stockholder who saved the $6000 to buy the machine *indirectly* did nine-tenths of the work.

"You got $2500 out of it. What did the stockholder get out of it?

"Well, the profits for last year were 5 per cent of all the money invested in the company. That means that the fellow whose $6000 you are using in the form of that machine got $300 out of the deal; that is, he would have got $300 if all the profit had been paid out in dividends. But one-third of the profit was held in the company, so he actually got $200.

"Now you want a raise. Where is it going to come from?

"If you were the guy that got the $200 for accounting for nine-tenths of the work, would you give up much? Of course you wouldn't.

"The only other way to get it is to raise the price to the customer. You know what our stuff sells for at the store. You buy our products yourself once in a while.

"Since V-J Day we have already raised the price 55 per cent and I'll bet you and your wife gripe a little bit when you buy back your own stuff. How much more would you be willing to pay before you would buy another brand or not buy at all?

"One thing that makes America such a good place is that the customer can do anything he wants and nobody can stop hiim. He can tell any corporation—including ours—to go fly a kite; and he can make it stick.

"The only reason you and I have jobs here is because the brass hats upstairs are able to find customers who are willing and able to lay the dough on the line and supply the money that meets our payroll. When there are no customers, there is no payroll. When there is no payroll, there are no jobs.

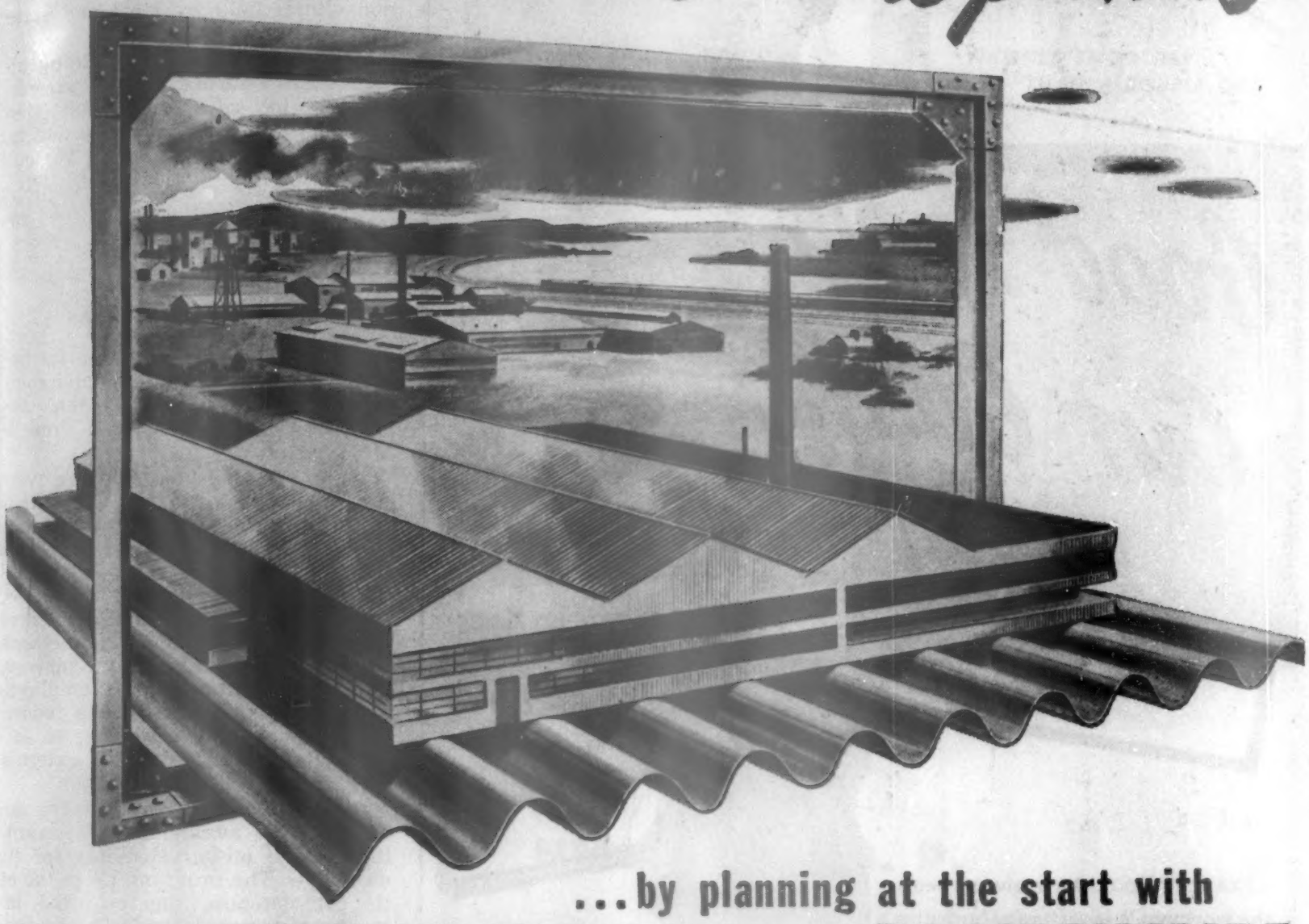
"You might think that the brass hats are tough on you, but, actually, it is the customer who is tough on them. Everybody in this company is in the same boat, and if we don't want the boat upset, we've all got to pull in the same direction."

That is the way I should talk, and I don't believe that there are many American workers who wouldn't say: "Okay, I'll play ball."

Seasonal Layoffs Being Reduced

More employees can look for year-round work and pay as a result of concerted efforts on the part of em-

You save on the frame *and on the whole picture*



...by planning at the start with

REYNOLDS *Lifetime* ALUMINUM INDUSTRIAL CORRUGATED

FIREPROOF, rustproof, needing no painting, Reynolds Industrial Corrugated is superior for any structure, new or old. Year-after-year maintenance savings make it a first choice of plant superintendents. But you get its full advantages when you plan buildings expressly for it.

Its light weight, combined with ample strength, permits economies in framing structure which should be incorporated in your original plans.

The fact that aluminum reflects up to 95% of radiant heat —materially reducing summer temperatures, helping to retain winter warmth—should be considered in your heating and ventilating plans.

The inside aluminum surface has high light reflectivity. Your illumination can be planned for better visibility at lower cost.

Our technicians will be glad to assist you in your planning, and to coordinate deliveries with your construction schedule. For full information write for literature.

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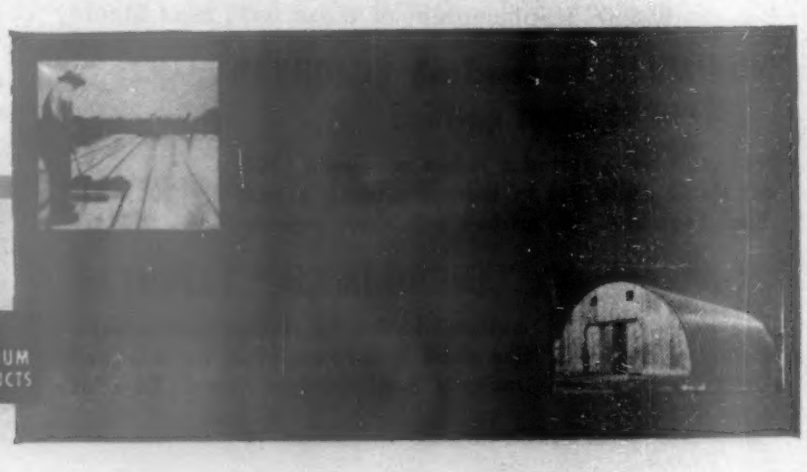
Building Products Division, Louisville 1, Ky.
OFFICES IN 32 PRINCIPAL CITIES



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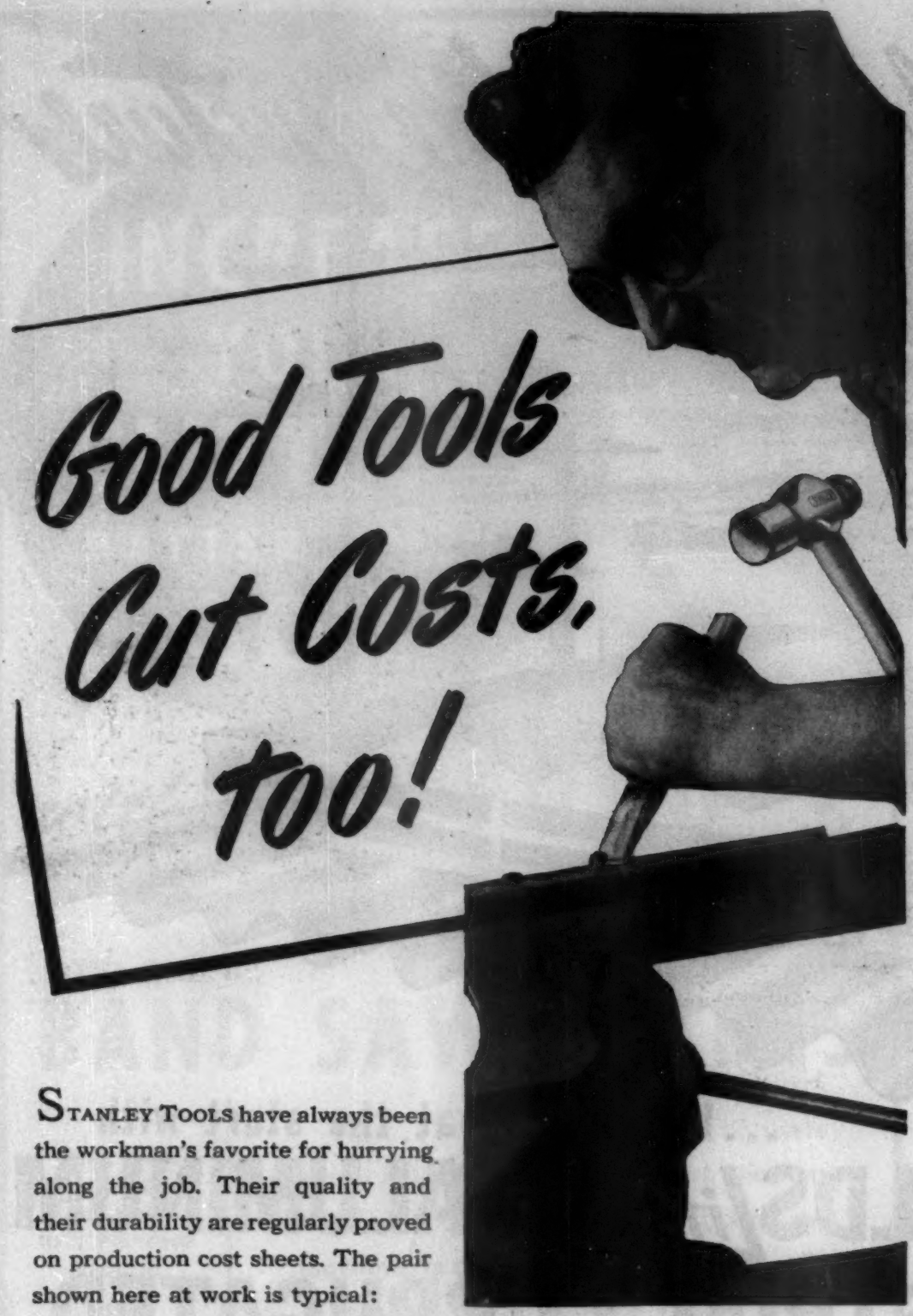
Shingles, Clapboard Siding, Corrugated and 5-V Crimp, Snap-Seal and Standing Seam Roofing, Weatherboard Siding, Built-Up Roofing, Nails, Gutters, Wall Tile, Casement and Picture Windows, Reflective Insulation, the "Alumi-Drome" (prefabricated utility bldg.).

IF YOU SEE RUST YOU KNOW IT'S NOT ALUMINUM

REYNOLDS *Lifetime* ALUMINUM BUILDING PRODUCTS



STANLEY TOOLS have always been the workman's favorite for hurrying along the job. Their quality and their durability are regularly proved on production cost sheets. The pair shown here at work is typical:

Stanley Ball Pein Hammer — No. 310 — 16 oz.–Octagon pattern–forged, polished head–high grade steel, superheat-treated – polished hickory handle securely wedged by "Evertite" process. Wide choice of sizes.

Stanley Cold Chisel — No. 990 – Quarter octagon pattern – chrome vanadium alloy steel, drop forged, oil hardened and tempered by a special process to produce a tough cutting edge. Sizes, to match the job.

How many hand tools in your plant are still in use yet badly worn? Replacement of these with new Stanley Tools will help cut costs in every department. Order from your distributor. STANLEY TOOLS, 151 Elm Street, New Britain, Connecticut.

THE TOOL BOX OF THE WORLD

STANLEY

Reg. U. S. Pat. Off.

HARDWARE · HAND TOOLS · ELECTRIC TOOLS

ployers to curtail seasonal layoffs. This was announced recently by the NAM as a result of reports from more than 200 employment stabilization clinics held by local and state industrial groups.

Methods used include building up inventories during slack periods, changes in sales and production methods, diversification of products, and training workers to fill various jobs.

Industry Group Builds Better Relations

An industry-wide program for improving relations in plants and communities has recently been announced by the American Iron & Steel Institute.

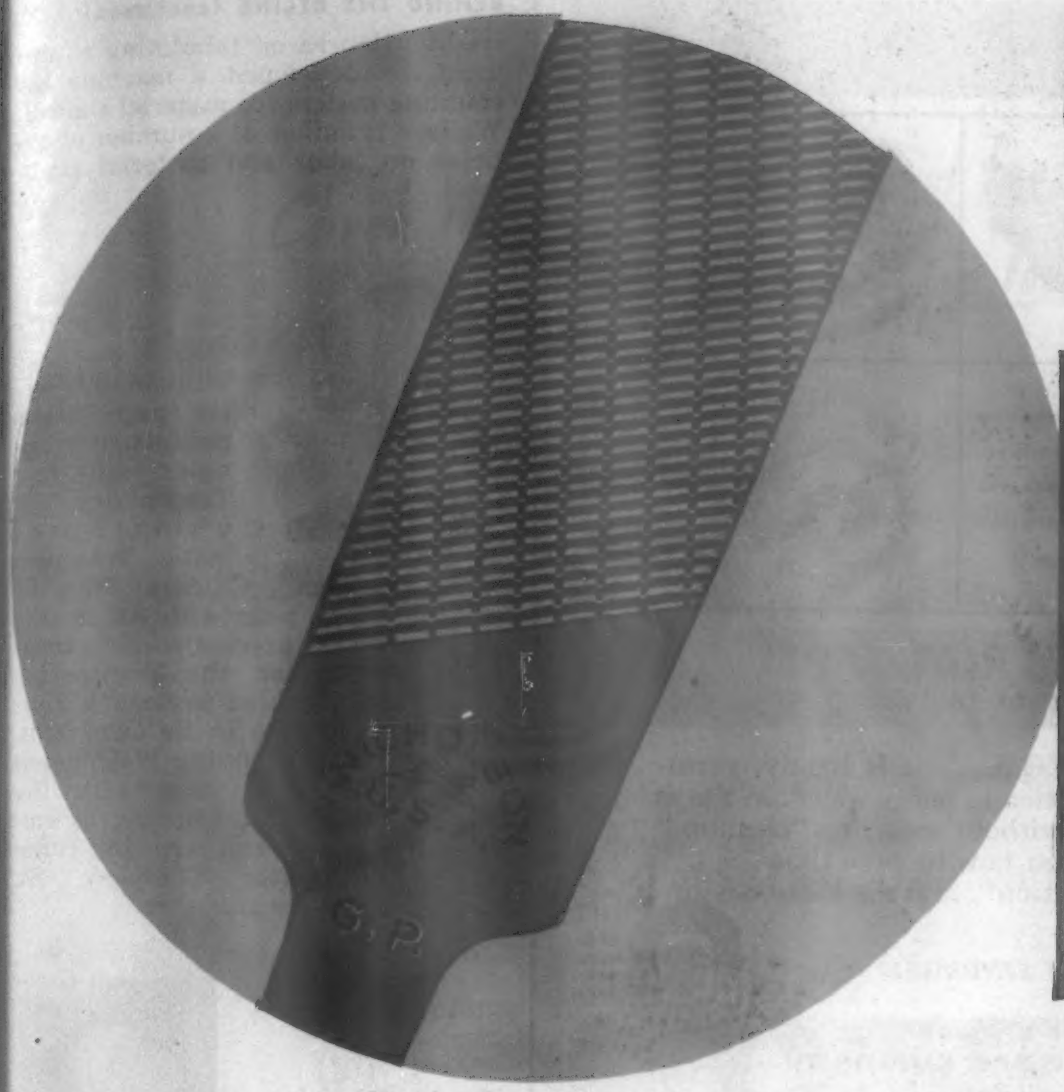
There are nine phases to the overall community relations program now being installed by steel mill executives in individual plants across the country. In the employee relations portion, one of the nine phases, there are ten individual points of action, which include a methods booklet, direct mail, attitude surveys, posters for bulletin boards, employee meetings, plant magazines, a reporter's guide, a feature service, an editor's clinic and, if desired, external magazines.

In addition, the Institute has announced the availability of consulting service on all elements for its members. The program, by virtue of its completeness, has achieved instantaneous popularity with management in industries far afield from steel making. Institute spokesmen say the program is virtually "tailor-made" for any large industrial organization interested in improving its community relations.

BEHIND THE BYLINE

Facts About *Factory's* Authors

Carl L. Wallace (page 87) is supervisory engineer with MacDonald Brothers, Inc., a management engineering firm in Boston. Born in Boston, Wallace engaged in the investment banking business prior to association with MacDonald Brothers. A number of years ago, he was with the Bath Iron Works at Bath, Me., and the Massachusetts Hospital Life Insurance Company of Boston. Back in the days when you couldn't get



CUTS FASTER THAN A SINGLE CUT

FINISHES SMOOTHER THAN A DOUBLE CUT

NEW! NICHOLSON G. P. MACHINIST'S FILE

The "happy medium" in general purpose files

TWO FILES IN ONE? Well, almost. This latest development in Nicholson file designing utilizes the fundamental principles of the regular Mill (single cut) and the regular Flat (double cut) files. . . . And combines them to give *metal-removing speed* with *smooth finish.*

The Nicholson G.P. (General Purpose) Machinist's File is not intended to supplant regular or special purpose files which are designed to do some single thing in the very best manner or the shortest possible time. But to the mechanic working on ALUMINUM, BRONZE, CAST IRON, MALLEABLE IRON, MILD STEELS, or ANNEALED TOOL STEELS, it is *the* general purpose file for hundreds of fabricating and machine-shop jobs. It is a thoroughly tested-and-proved file for saving time and increasing production.

Construction. The Nicholson G. P. Machinist's File (also made in Black Diamond brand) has the shape of a regular Flat file — except that it does not taper in thickness. It comes in 8", 10", 12" and 14" lengths. The teeth are single cut (like a regular Mill Bastard file), but are divided by angular serrations. These produce shorter cutting *edges*, break up the filings — help remove stock rapidly and still leave a smooth finish.

• Try this unusual file without delay. Place a trial order with your industrial distributor at once.

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NICHOLSON FILES *FOR EVERY PURPOSE*

F.O.S. INDUSTRIAL TAPE
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REDUCE PRODUCTION COSTS—F.O.S. Tape is handy, versatile, inexpensive. Simplifies production in *many* ways . . . Stays put—but can be removed quickly without requiring "cleanup." Let SEAMLESS analysts show you how to save time and money with F.O.S. No obligation! . . . *Write today for samples and prices.*

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Check which of these will help you most

- Higher Production
- Better Quality
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- Dustless Operation

Manufacturers, both large and small, in your own field have achieved not merely one or two but all of these objectives through application of

THE MIKRO PLAN FOR PROCESSING EFFICIENCY

The Mikro-Plan is not a theoretical treatise. It is a working system based on the data from 55,000 Laboratory tests made over the past 25 years . . . reinforced by performance records from installations of MIKRO-PULVERIZERS, MIKRO-ATOMIZERS and the new MIKRO-COLLECTORS.

If you have a pulverizing or dust control problem let our engineers study it for you. They will tell you frankly whether or not our equipment, integrated in the Mikro-Plan will meet your needs.

It will cost you nothing to investigate the merits of the Mikro-Plan. Just write today for your copy of our Confidential Test Grinding or Dust Collecting Data Sheet.

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MIKRO-PULVERIZER (FINE) -ATOMIZER (ULTRA FINE)
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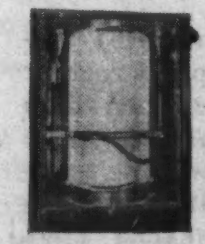
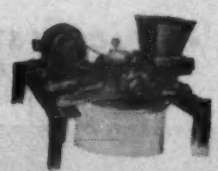
Also Makers of the MIKRO-COLLECTOR



MIKRO-ATOMIZER for ultra-fine grinds.

MIKRO-COLLECTOR for optimum dust recovery.



MIKRO-PULVERIZER for granular or fine grinds.

1706

BEHIND THE BYLINE (continued)

credit balances on tabulating equipment, he developed a machine accounting system for material control. Wallace is author of a number of articles on labor and material problems.

William J. Perrie (page 104) is production manager of the Transporter Division, Automatic Transportation Company, Chicago. Now in his eighteenth year with Automatic, he has held his present position since May, 1942, when the Transporter line of hand trucks became a division of Automatic in its own right. In 1922, after attending Washington University, Perrie was with the Pullman Company, Chicago, as employment agent, and with the Hussman Refrigerator Company, St. Louis, as service manager.

E. A. Blythe (page 123) began his business experience with Federated Metals Division, American Smelting & Refining Company, in 1937. He rose from the job of laborer to the position of assistant superintendent of the aluminum department. In 1946, during a tour of service in the Army, he received B.S. and M.E. degrees in mechanical engineering from Virginia Polytechnic Institute. Blythe, in the Corps of Engineers from 1943 to 1946, was a sergeant.

James J. Edwards (page 76), methods engineer at Oldsmobile, joined the company in 1940. Before that he worked for the John Deere Tractor Company and the Ternstedt Division of General Motors. In 1942, he was appointed supervisor of methods engineering at Oldsmobile, and in 1940 became general methods engineer in charge of plant layout, and the methods engineering department. Edwards graduated from Iowa State College in mechanical engineering.

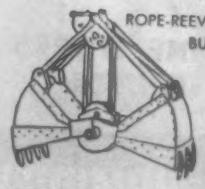
Check this list of Brownhoist features... when you're thinking of a diesel electric locomotive-crane

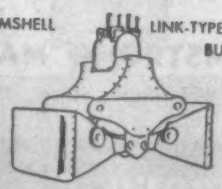
- ✓ Travel power applied direct to axles by 2 oversize inside hung spring-mounted motors
- ✓ Motor current supplied from generator direct connected to Diesel engine
- ✓ Travel speeds up to 15 MPH. for heavy duty switching service
- ✓ Helical gear reducer transmits power for hoist drums, swing, and boom
- ✓ Double disc roller bearing mounted rotating clutches
- ✓ Electric swing available at extra cost
- ✓ Cast steel rotating bed insures rigidity and permanent alignment of machinery
- ✓ Monitor-type cab provides 360° visibility
- ✓ 14″ safety clearance between car body and rotating bed
- ✓ Roller bearings at all essential points

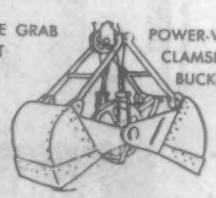
CAPACITIES 30 TONS AND UP

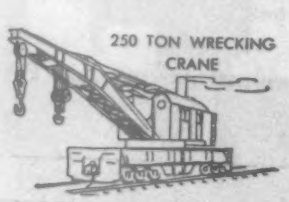
Only in the new Brownhoist Diesel Electric Locomotive-Crane can you check affirmative throughout this list of features that mean faster, safer, easier and more economical materials handling and car switching. Why accept less when it costs no more! Be sure you get the *best* when you invest.

BROWNHOIST BUILDS BETTER CRANES


ROPE-REEVE CLAMSHELL BUCKET


LINK-TYPE ORE GRAB BUCKET


POWER-WHEEL CLAMSHELL BUCKET


250 TON WRECKING CRANE

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Without obligation, please demonstrate your new PAINT LIFT on our work.

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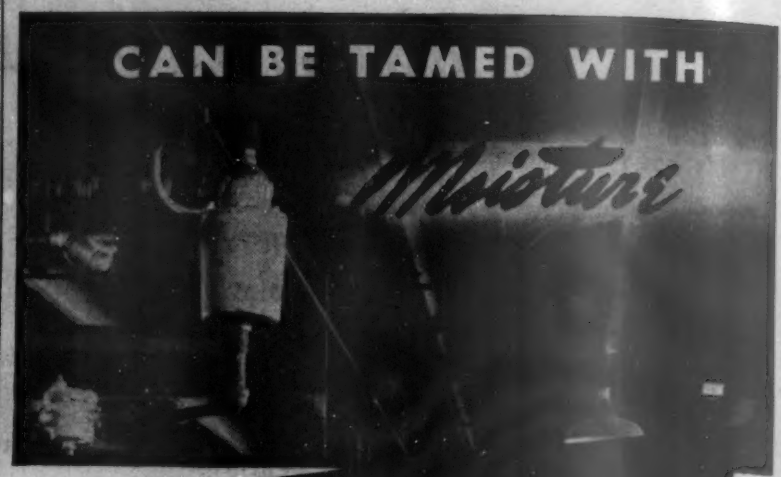
STATIC

CAN BE TAMED WITH



$2780 LOSS to a plate glass company when a static spark ignited lacquer thinner.*

$21,500 DAMAGE in a cotton mill when a static spark set fire to a mixture of naphtha vapor and air as treated cotton duck passed through a dryer.*

2 KILLED, 30 injured, $140,000 destruction because Hydrogen leaking from an air cylinder produced a static spark that exploded the gas.*

*Insurance company reports.

Static is a trouble maker during the winter heating season when the air is dry. When static potentials build up, the danger of a spark discharge represents a terrific fire and explosion hazard when volatiles, gases or dust are present. Static plays hob in other ways, too—makes many materials difficult to handle, reduces machine speeds, generally retards production.

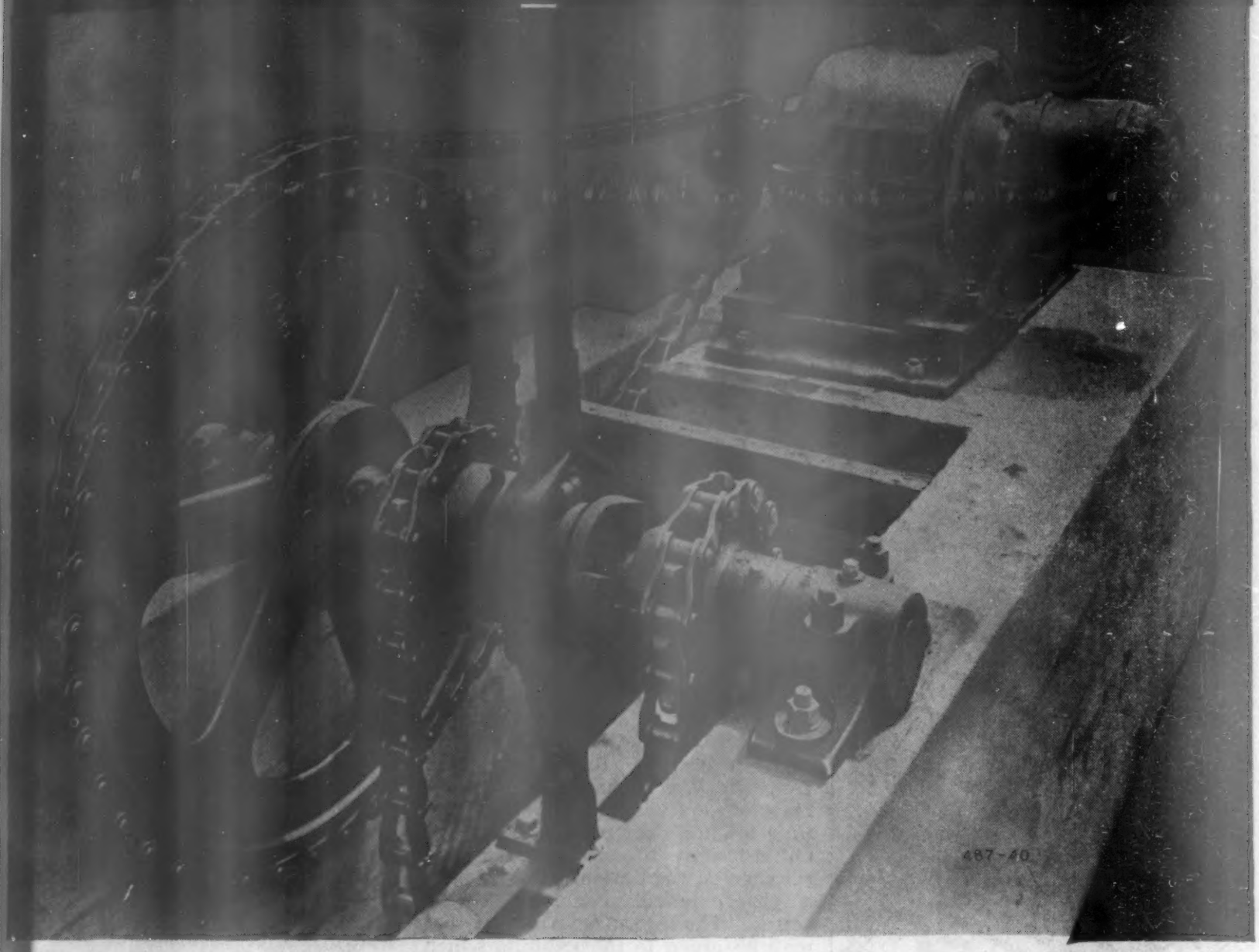
There is a simple, economical answer to this problem: *add moisture to the air* with Armstrong Steam Humidifiers. An invisible film of moisture conducts static charges harmlessly to the ground. Armstrong Steam Humidifiers give you the humidity you want where you want it. Installed like unit heaters, they are simple, automatic, inexpensive to operate, quiet and dependable.

SEND FOR NEW BULLETIN No. 177—discusses humidification, contains useful charts and tables, explains operation of Armstrong Humidifiers and how to select them. Yours for the asking.

ARMSTRONG MACHINE WORKS
804 Maple Street, Three Rivers, Mich.

ARMSTRONG *Steam* HUMIDIFIERS
Easy to Install and Maintain . . . Automatic . . . Economical

CHAIN DRIVES FOR EVERY SERVICE
...including Unit Machinery



CHAINS—all standard types of malleable, SUPERMAL and steel roller chains for light to heavy duty drives.

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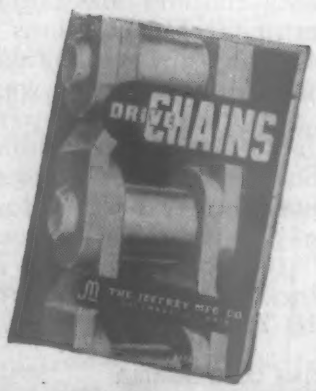

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SIGNIFICANT LABOR DEVELOPMENTS

BENJAMIN WERNE, Adjunct Professor of Industrial Relations, New York Univer and a Member of the New York Bar

Period Surveyed: July 1 to August 1

Trend Indicators

Wage Hour

SECTION 9 BARS RECOVERY OF OVERTIME

Employees are not entitled to recover a claim for overtime worked nor may they recover liquidated damages, where the company showed that in failing to make payments for overtime worked, it acted in good faith in the belief based upon reasonable grounds, that the Fair Labor Standards Act did not cover its employees and relied upon the administrative practice and enforcement policy of the Wage Hour Division. (Darr v. Mutual Life Insurance Company, CCA-2)

EMPLOYER MAY NOT PLEAD GOOD FAITH DEFENSE

A construction company, which did work on defense base under a cost-plus contract with the War Department, was held liable for failure to pay employees overtime under Section 9 and 11 of the Portal-to-Portal Act, since it did not prove reliance in good faith on any orders, regulations, etc., or the governmental agency. The introduction of letters from the War Department procurement officers which prohibited overtime for non-exempt employees was not sufficient to establish good-faith reliance on regulation, order, etc., of a governmental agency. Said the court: "The best construction that may be given to the exhibits which defendants contend are tantamount to governmental regulations or orders, is that they emanated from individuals who, it is true, were connected with the War Department; that is a far cry from holding that these individuals were an agency of the United States upon whose fiats reliance in good faith could be placed." (O'Riordan v. Nick F. Helmers, Inc., N. Y. City Court, Trial Term, N. Y. County)

TRAVEL TIME COMPENSABLE

An employee is entitled to receive overtime compensation for travel time while working for a pictorial research company since he was driving the company's motor vehicles with its camera equipment and crew during the overtime period. (Ercole v. Pictorial Research, NYSC, Trial Term, N. Y. County)

HELD EXEMPT

An assistant cashier of a bank was held to be an administrative employee exempt from the provisions of the Fair Labor Standards Act, since he was the prime authority in making loans totaling nearly $[illegible] 000,000, handled insurance loans, and was a member of the management committee of the bank. (Kaczanowski v. Home State Bank, USDC E. Wis.)

During the time an employee was employed by a pictorial research company as a camera man on production of a commercial motion picture for cigarettes, he was held to be a professional employee exempt from the Act. (Ercole v. Pictorial Research, NYSC, Trial Term, N. Y. County)

EMPLOYER CHARGED WITH KNOWLEDGE OF WHAT REGULATIONS DEMAND OF RECORDS

Where the Wage-Hour Administrator enjoins an employer from violating the Act, alleging that the employer's wage and hour records are not properly kept and in certain respects are false and fictitious, the employer is not entitled to a detail of such allegations, since the sufficiency and truthfulness of the records are known to the employer. Said the court: "The form, extent, sufficiency, and truthfulness of their records are known to the defendants. They are charged with knowledge of what the law and regulations demand of such records; they know whether the entries are true or false. Therefore they need no information from the plaintiff to answer an attack on the adequacy or accuracy of their records." (McComb v. Hardy, USDC E. Va.)

ATTENDANCE BONUS PART OF REGULAR HOURLY RATE

An attendance bonus, paid by an employer to female employees who worked a full work week and reported on time, must be included as part of the employees' "basic hourly rate" for purposes of computing overtime. (General Match Company Decision of Hearing Examiner under Public Contracts Act)

Veterans

VETERAN REFUSING TO JOIN UNION WAS JUSTIFIABLY DISCHARGED

Where a veteran refused to join a union which held a closed-shop contract with the company, the employer had "just cause" for firing him. Since closed-shop contracts were illegal before the Taft-Hartley Act, an employee was bound by such a contract when he sought job benefits of the Selective Training and Service Act. To permit a non-union veteran to work in the face of the condition

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Wire Brushes

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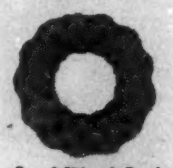

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THE *Multiple-Purpose* FLOOR-MAINTENANCE MACHINE THAT'S

Two Sizes in One!

Here is a floor-maintenance machine that not only can be used for many types of floor care, but also affords the further economy of a machine that is two sizes in one. This *100 Series Finnell*, in one of the larger sizes as shown above at left, can be reduced to the small size unit shown in circle.

Note the low, trailer-type construction of the machine, and how easily it goes beneath furnishings. Thus it is ideal for use in crowded areas. In fact, the dual size feature and low construction of the machine adapt it to use on many floors otherwise inaccessible to machine care.

As easy to handle as a household vacuum cleaner, yet this *Finnell* is powerful . . . fast . . . and thorough. Mounts a G. E. Drip-Proof Capacitor Motor . . . is equipped with Timken Bearings. And the ruggedly constructed worm drive, housed in an extra-capacity leak-proof gear case, lubricated for 1500 hours, assures smooth, noiseless performance. A precision product throughout. Three sizes: 13, 15, and 18-inch brush diameter.

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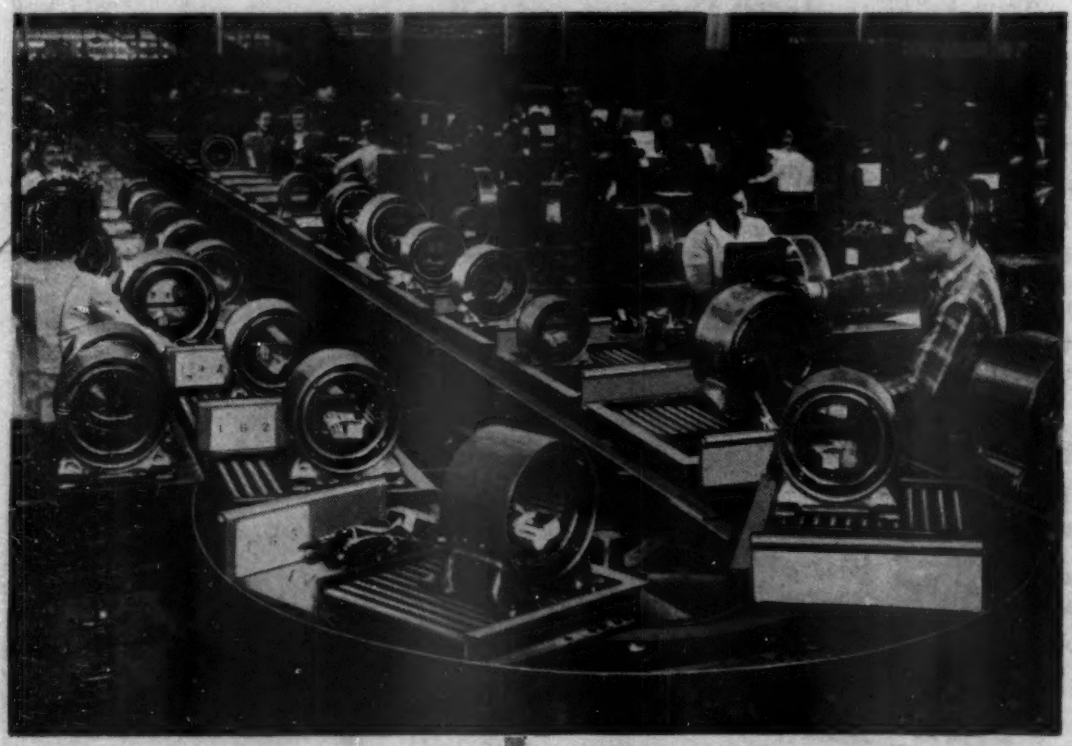

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LABOR DEVELOPMENTS (continued)

of the agreement that all employees must belong to the union, would be forcing the employer to violate the union agreement. Prior to entering the service, it was pointed out that the veteran "accepted" the benefits of the union's relationship with the company, such as having his wages raised, that he paid 50¢ a week for a working permit, and also paid the shop steward the union's initiation fee. "While the Act must be construed liberally for the benefit of a veteran, we may not hold that a condition of employment to which the veteran himself has in fact subscribed may be disregarded either by him or by his employer." (Cornelius Kemp v. John Chatillon & Sons, Inc., CCA-3)

VETERAN ENTITLED TO SIMILAR JOB

Where a veteran's former job (supervisor of welfare) had been abolished by the employer and was not intended to be recreated, he was entitled to reemployment as a departmental assistant which combined recreational and welfare work. The veteran cannot be denied the job on the grounds that it is occupied by a woman who does some counseling of women and keeps books, since neither being a woman nor keeping books was an essential qualification of the job and in addition the veteran had seniority over the woman. (Byrd v. North American Aviation, USDC S. Calif.)

EQUIVALENCY OF POSITION

The court in passing on the test of equivalency of position ruled that a veteran must step back upon the escalator of employment as of the time of his request for reemployment. "If the escalator moves down instead of up, the veteran must accept that detriment precisely as the employer must carry the burden of increased salary if the escalator turns upward."

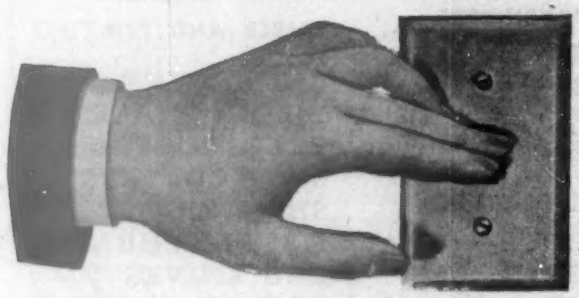
A veteran, who accepted a certain position because he expected the employer to reemploy him as soon as possible in a position the equivalent of his former position, did not thereby waive his statutory reemployment rights, although his first protests concerning his status and pay were made more than one year after accepting the position. (Schreier v. Fishman Company, CCA-3)

SENIORITY NOT BROKEN BY TRANSFER

While a veteran was required by his employer to make a new application upon being transferred from one job to another, he is entitled to rein- statement in the higher rated job despite the company's designation of the position as temporary. This device to break his continuity of service was a subterfuge, and amounted to a constructive fraud on the veteran's rights, which entitled him to

How the GE Mercury Switch helps you do a better wiring job

It's a 10-ampere, 125-volt, T-rated switch. This rating answers the demand made by today's heavy loads. The mercury switch is equal in interrupting capacity to the best specification-grade switches. And, it carries the Underwriters' Laboratories approval — another indication of proved reliability and sound construction.



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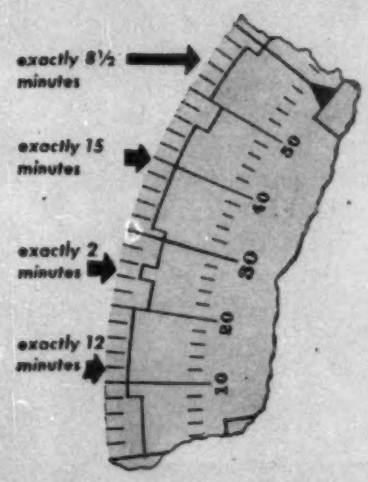
Process Timing



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reinstatement with pay in the amount he would have received had he not been denied the job to which he was entitled under the Selective Training and Service Act. (Martin v. du Pont de Nemours & Company, USDC Middle Tenn.)

Labor Management Relations

***EMPLOYER'S RIGHT TO INSIST ON ELECTION**

An employer has the right to insist on an election by the National Labor Relations Board to determine the union's majority prior to entering into negotiations, provided his request is based on *bona fide* doubt of majority representation. However, if the employer's insistence is motivated by "a rejection of the collective bargaining principle or a desire to gain time within which to undermine the union," he is guilty of an unlawful refusal to bargain. (Artcraft Hosiery Company and American Federation of Hosiery Workers, NLRB)

***LAID-OFF EMPLOYEES NOT ENTITLED TO VOTE IN ELECTION**

Laid-off employees, who have no reasonable expectancy of reemployment, are ineligible to vote in a representation election. (Waterman S. S. Corporation, NLRB)

***INJUNCTION DENIED WHERE UNION FAILED TO COMPLY WITH ACT**

A federal district court denied an injunction to the regional director of the NLRB requiring an employer to bargain with a union which had called a strike in violation of the Taft-Hartley Act 8(d). In the instant case, the union failed to comply with the law's requirements for a 60-day notice to the employer and a 60-day cooling off period (Graham v. Boeing Airplane Company, USDC W. Wash.)

UNIT APPROPRIATE

The mere fact that a parent labor organization awarded to pipe fitters jurisdiction over all pipe fabrication work is not binding on it or on the board. Pipe and machine welders, therefore, may constitute a single appropriate unit if they so indicate by a self-determination election. (U. S. Pipe & Manufacturing Company and International Association of Machinists, NLRB)

GUARDS CONSTITUTE SEPARATE UNIT

Guards whose activities are basically custodial rather than monitorial may be appropriately grouped in a separate unit. (Westinghouse Electric

* In this classification, items marked with an asterisk also are considered to be trend indicators.

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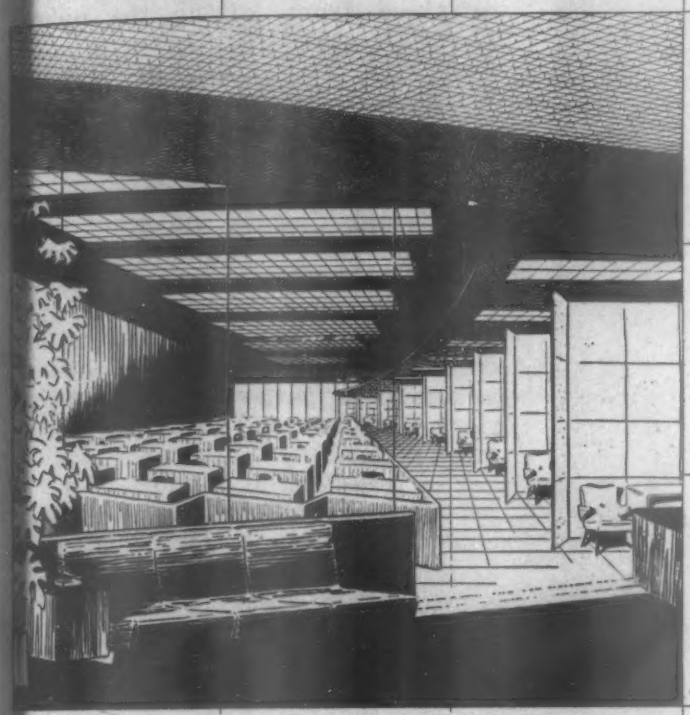

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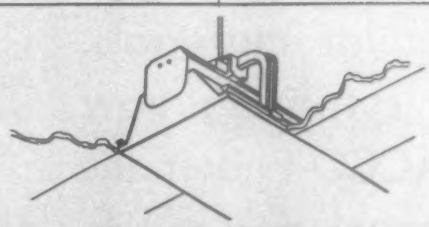

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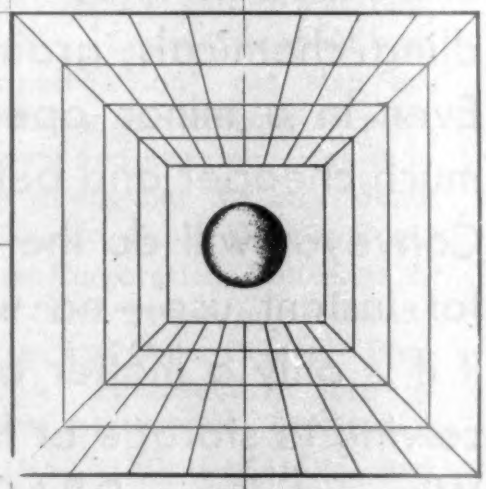

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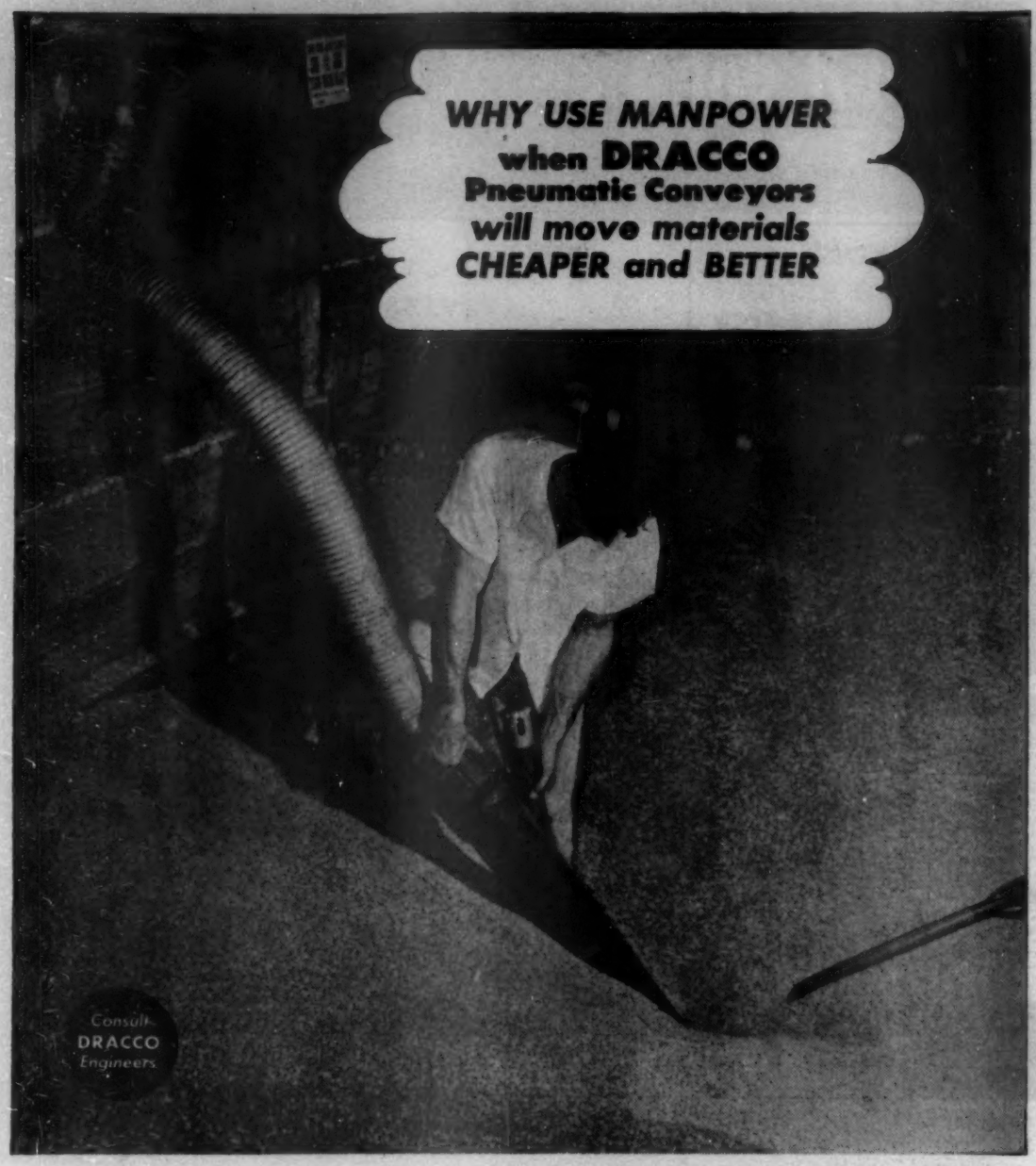

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Corporation and United Electrical, Radio & Machine Workers of America, NLRB)

***HELD INTERFERENCE**

An employer was guilty of interference where he interrogated employees concerning their union sympathies and how they would vote at a NLRB election, threatened to shut down or move if the union succeeded in organization, and promised benefits if the employees refrained from joining the union. (Artcraft Hosiery Company and American Federation of Hosiery Workers, NLRB)

***NO INTERFERENCE**

On the other hand, no interference was found, despite the grant of a wage increase, a vacation plan, and group insurance, during an organizational campaign, where it was part of an employer's system-wide increase in all its plants and followed a historical pattern. (Artcraft Hosiery Company and American Federation of Hosiery Workers)

The pre-election conduct of a supervisor who said that another union could get them better wages and a more favorable contract did not constitute interference in view of the employer's neutrality. (Kinsman Transit Company and Seafarers International Union of North America, NLRB)

***HELD NON-DISCRIMINATORY**

The discharge of an active outside union member for excessive absenteeism was held not discriminatory. It was pointed out that during a 57-week period, the employee worked only 11 full weeks without absence. Even if a reasonable allowance was made for excused absences, the employee's absences were excessive, particularly since he had a week's vacation in addition. (Clark Phonograph Record Company and United Electrical, Radio & Machine Workers of America, NLRB)

***EMPLOYER'S IMPOSITION OF CLOSED-SHOP STATUS HELD NOT UNFAIR**

A bus company, which purchased the assets of a bankrupt competitor's bus company and offered a contract to the employees if they would join the closed-shop union with which the purchasing company had contractual relations, was held not to be guilty of an unfair labor practice. The old employeers having lost their employer ceased to be group and became individual, employed workmen. (N. Y. Labor Relations Board v. Club Transportation Corporation, NYSC, Westchester County)

***EMPLOYER'S RIGHT TO RETIRE EMPLOYEES**

While refusal to bargain over retirement plan is an unfair labor prac-

The FANMIX BURNER gives you more heat from gas or oil

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In all types of Coppus-Dennis **FANMIX** Burners — straight gas or combination gas-oil — we utilize the energy of the fuel under pressure to drive the burner fan and deliver air in the proper proportion to the fuel flow. This exclusive "pinwheel action" *mechanically* mixes fuel and air in exactly the right proportions for truly radiant, non-luminous heat.

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FANMIX can easily be operated with your present furnace and stack, requiring only minor changes in other equipment. Or if you're planning on new boilers, remember that **FANMIX** relieves the furnace from the burden of mixing, creates its own forced draft and takes smaller pipe sizes. Which means you can plan on reduced combustion space, less stack, no forced draft equipment and lower installation costs all around.

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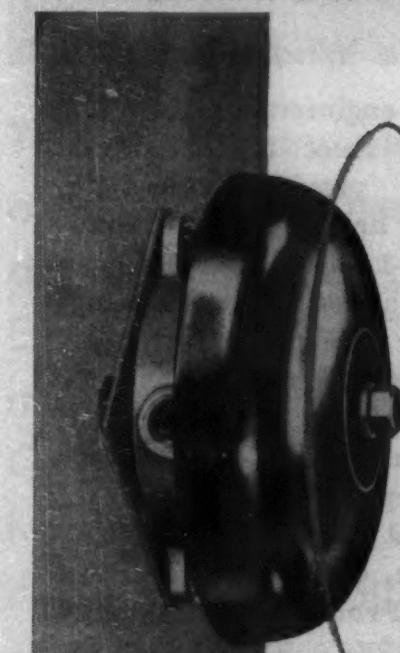

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LABOR DEVELOPMENTS (continued)

tice (Inland Steel), a union cannot compel rehiring of employees retired pursuant to the company's unilaterally instituted pension plan. Although no reference to the plan was contained in the last contract, it did not seem reasonable, said the court, "that the company bargained the pension plan out of existence when it felt in two successive years that this was not a proper subject for collective bargaining at all. Second, in the disputed situation described above, it seems likely that some explicit reference to the plan in the new contract would be necessary before a standard seniority clause, probably carried over from previous contracts, could control. Third, and most important, the wording of the seniority clause weakens the union's position. The clause provides that rules of seniority shall prevail with respect to laying off and rehiring of employees. This phraseology would not ordinarily encompass this kind of permanent separation from the employ of the company." (Bakery Union v. National Biscuit Company, USDC E. Pa.)

*MASS PICKETING UNLAWFUL

In an action to restrain picketing, the Ohio Court recognized two fundamental rights accorded by the law in the case of disputes:

1. The right of the members of a union to strike.

2. The right of others, not desiring to strike, to work.

Accordingly it held: "This court in this matter is interested in the preservation of peace and the conduct of the strike in a lawful manner. It has no right and exercises no authority in terminating or denying the right to carry on the strike, except that it must be done by lawful methods." In order that this may be done, the court issued certain orders for the conduct of all parties involved; it ordered that various classifications of employees wear different identification tags, the number of pickets be limited, and that the pickets be so placed as to leave room for free ingress and egress to and from the plant at all times. (Hoover Company v. Electrical Workers, Ohio Ct. of Common Pleas)

Picketing

The Missouri Supreme Court ruled that peaceful picketing, even though no labor dispute was involved, may not be enjoined, where conducted in an effort to compel the employer to enter into a contract with union employees and union subcontractors. (Caldwell v. Anderson, Miss. Sup. Ct.)

Peaceful picketing for a closed shop which was banned by state law was unlawful. (Mascari v. International Brotherhood of Teamsters Union, Tenn. Sup. Ct.)

The Tennessee Supreme Court en-

Build Better Quicker with this "Package"

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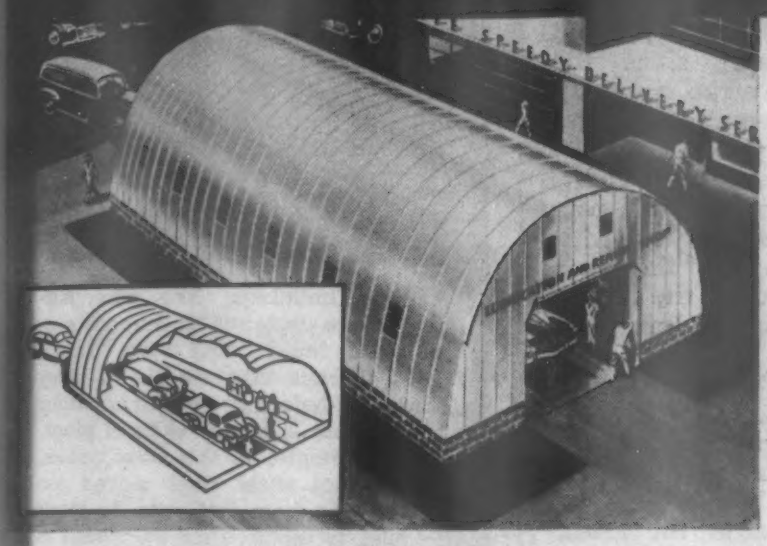
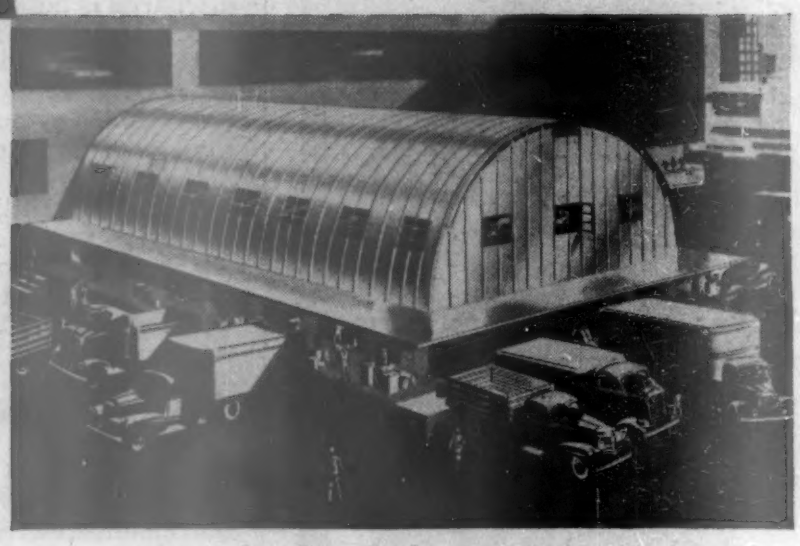


garage, repair shop



loading dock, etc., etc.

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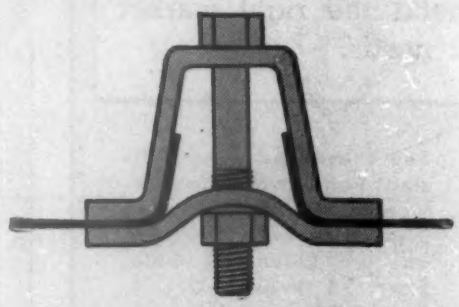

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joined the picketing of a store and interfering with customers on the grounds that picketing, though peaceful, must be definite and truthful. (Watson Company v. Wilson, Tenn. Sup. Ct.)

Discharge

Failure to pay a discharged worker immediately after his discharge as required by state law resulted in an award of back pay to cover the 3-week delay. (In re arbitration between Hiram Walker & Sons, Inc., and Distillery, Rectifying & Wine Workers' International Union of America)

Where the union failed to file and prosecute a grievance within the 3 days prescribed in the contract, the discharge is not arbitrable. The existence of a strike in no wise affected the filing requirement, since the union was notified by the company and there was no severance of relations between the parties.

Note: While substantive rights should not lightly be denied, particularly those involving the discharge of an employee, "they can only be exercised through the framework of the contractual administrative procedure."

"The concept of reasonableness urged by the union," said the arbitrator, "cannot be permitted to the extent that the arbitrator be requested to ignore all the time requirements contained in the grievance procedure of the contract." (In re arbitration between International Harvester Company and United Farm Equipment & Metal Workers of America)

Discharge was held proper where a guard was found sleeping on the job, even though it was his first offense. (In re arbitration between Lockheed Aircraft Corporation and International Association of Machinists); and where a neurotic employee had been given every opportunity to make good but failed. (In re arbitration between Whiting Machine Works and United Steelworkers of America)

Discharge was justified where a union steward persistently refused to work on a job to which piece rates had not yet been assigned, despite the contractual provision that employees were under a duty to run the job pending decision on the percentage and piece rates. (In re arbitration between Goodyear Decatur Mills and United Textile Workers)

Wages

The fact that the contract provides that the union should receive a full statement of reasons for the protested denial of a merit increase does not entitle it to share equally with the company the discretionary authority to determine whether merit increases should be granted. The employer is obligated, however, to dis-

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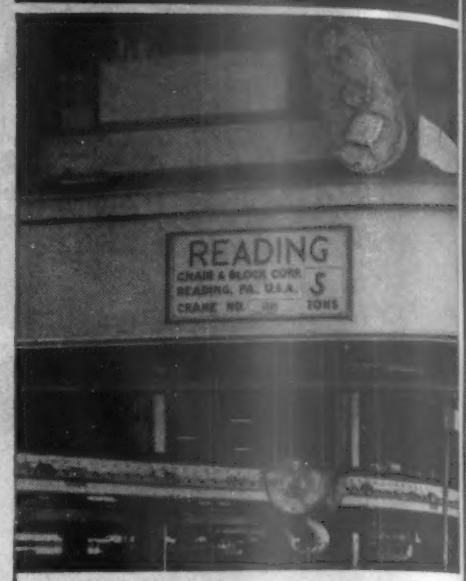
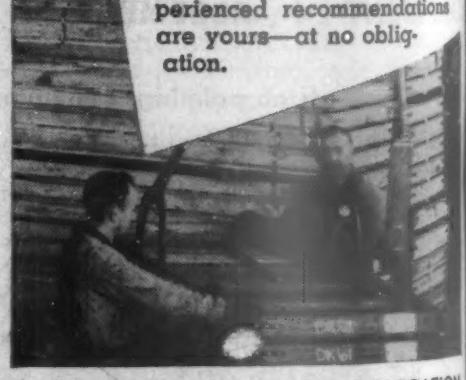


• New buildings, like new machines, are *designed* to increase output and reduce unit costs. That's why it pays to consult a Reading Engineer *before* you install handling equipment in a new shop or plant. For example, in this new annex, crates of sheet steel moved too leisurely from flat cars, to stock pile, to motor truck . . . until a Reading Engineer was consulted. After careful analysis, 2 *specially-designed* 5-ton Reading Cranes, equipped with electric push buttons were recommended and installed. Now crates "step lively", handling time is reduced . . . *and fewer men move more materials, more easily!* Start your new building "off on the right foot", now. For faster, more economical materials handling, call in a Reading Engineer. His experienced recommendations are yours—at no obligation.



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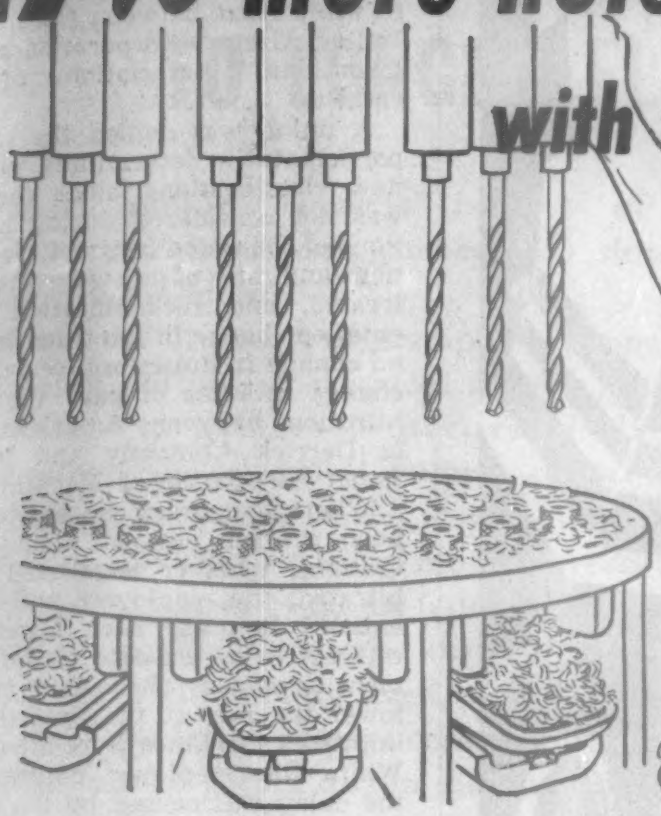

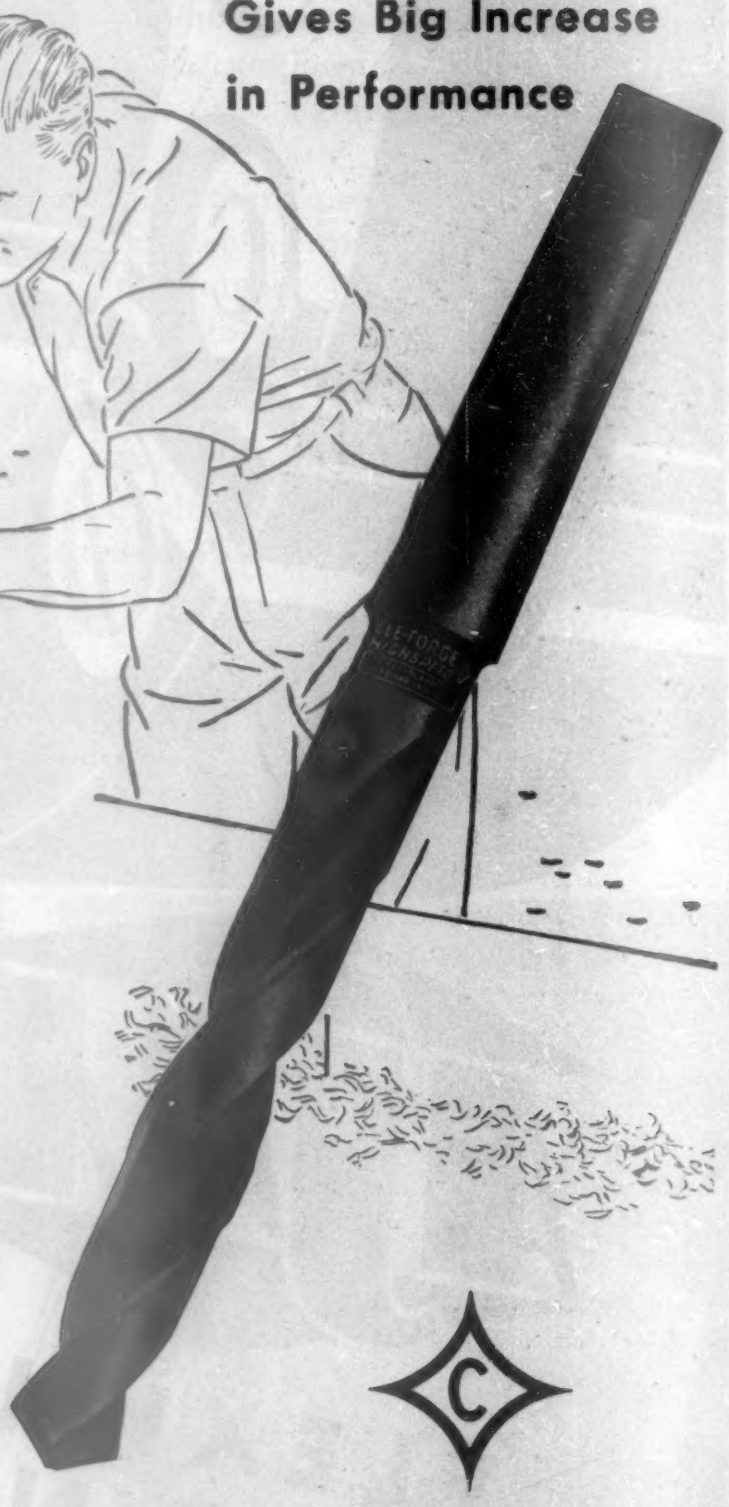

● CLE-FORGE High Speed Drills had been giving good performance on this job—drilling holes 1¾" deep in cast iron at 80 f.p.m., with an average of 245 holes per grind. ◈ One of our Service Representatives, however, believed that even better results could be obtained by using another type of CLE-FORGE High Speed Drill (also a stock item). By following his recommendation *the average number of holes per grind was increased to 312.*

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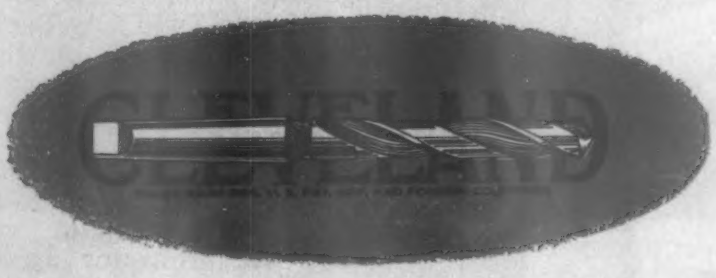

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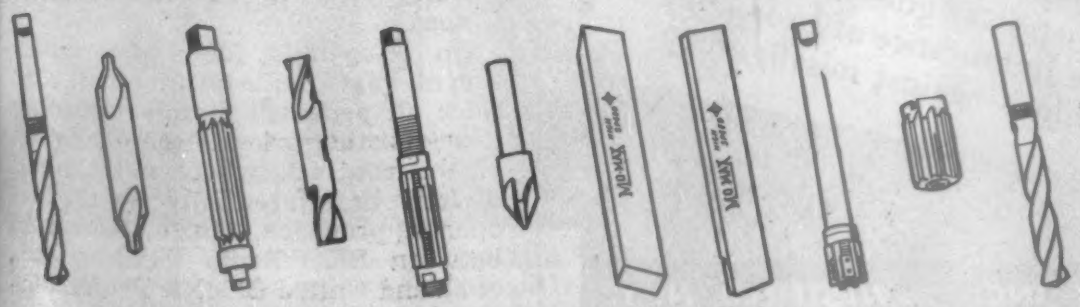

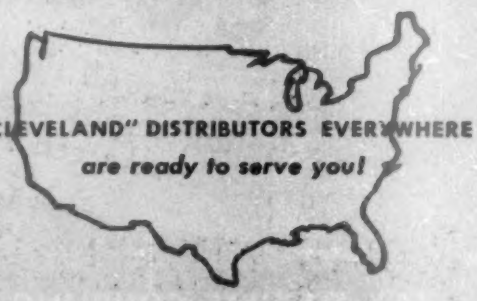

close to the grievant and union member all records and other matters considered in deciding the case. (In re arbitration between Consolidated Vultee Aircraft Corporation and International Association of Machinists)

A union was denied the right to participate in determining rates for new classifications, since the issue was not considered during negotiations of the union contract, classifications and rates of pay were separately treated, and reclassification which entailed change in job titles involved no change in duties and certainly no change in rates of pay. (In re arbitration between American Hoist & Derrick Company and International Association of Machinists)

Where temporary piece rates have been set for new or changed operations, whether negotiated or arbitrated, the employers will not be entitled to make such lower rates retroactive to the date of the agreement or award, where they failed to lower the rate at the time the new improved machines were introduced While the employer claimed that the delay was caused by the union's deliberate procrastination, it was held that a month's retroactivity had no relation to the actual dates upon which the machines were installed, since they varied from a few months to 5 years. (In re arbitration between Associated Shoe Industries of Southeastern Massachusetts, Inc., and Brotherhood of Shoe & Allied Craftsmen)

In considering an employer's ability to pay in settling a wage dispute, the arbitrator emphasized the profitability record over a period of years. Short run variations in profits cannot of themselves be decisive for wage rate changes. (In re arbitration between Twin City Rapid Transit Company and Amalgamated Association of Street, Electric Railway & Motor Coach Employees of America)

In determining what is meant by "continuously employed" to be eligible for an automatic wage increase, the arbitrator agreed that the employer's interpretation that "continuously employed" for 6 months, means that the employees must accumulate a total of 6 months of *actual* work, as distinguished from 6 months on the job. (In re arbitration between D. M. Watkins Company and Playthings, Jewelry & Novelty Workers International Union)

On re-opening for a determination of wages, an arbitrator will consider all pertinent factors including those existing prior to the execution of the contract, where not limited directly or inferentially by the re-opening provision. (In re arbitration between RKO Radio Pictures Inc., et al. and United Office & Professional Workers of America)

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Life-Line motors, now built in sizes from 1-15 hp, are available from stock in standard and near-standard types. "Specials" in Life-Line design are available on short shipment. Other sizes and types—up to 200 hp—soon will be changed over to modern Life-Line design. Check your nearest Westinghouse office for deliveries—or write or wire today to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

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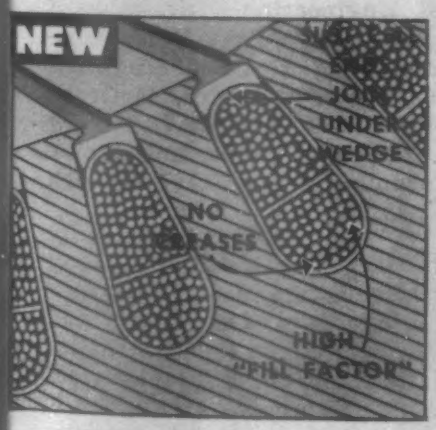
Life-Line motors

Rectangular slot design leaves many unfilled pockets for dirt, dust and moisture to accumulate and cause deterioration.

Old slot shape frequently required tapping last wires of the coil into position with resulting possible damage or weakening of insulation.



Pockets are eliminated—cell insulation is lapped over and covered by wedge. No sharp creasing of insulation is necessary.

Life-Line "pear-shaped" slots permit coils to be inserted snugly into position without need for tapping or weakening of the insulation.

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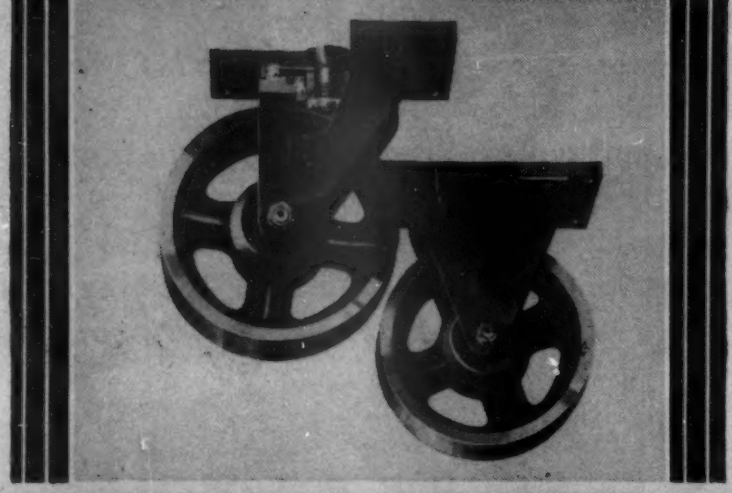
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Unions, Management, and the Public

E. WIGHT BAKKE, Director of the Labor and Management Center; Sterling Professor of Economics, Yale University; and **CLARK KERR,** Director of the Institute of Industrial Relations; Professor of Industrial Relations, University of California. Harcourt, Brace & Co., 383 Madison Ave., New York. 946 pages. Indexes of authors, titles. $5.

A compilation of "readings and commentary" by many different authors, discussing the origins, development, organization, and functions of unions, the influence of their policies and practices on the worker as an individual, on management, and the public. Divided into five sections: The Development of Unions; Response of Management; Collective Bargaining; Terms of the Agreement; and The Interest of the Community.

Mechanization Takes Command

SIEGFRIED GIEDION, Ph.D. Oxford University Press, 114 Fifth Ave., New York. 743 pages. Photographs, drawings. $12.50.

A study of the history of mechanization from early time through the modern age, with an inquiry as to what the future may bring. Man's interest in motion is reported, from the Greek philosophical conception of time and its place in the universe to the modern motion-time studies in industry. The influence of mechanization on the individual and his way of life, as well as its effect on industry is considered, taking simple examples from real life, such as mass-production of bread, the revolutionary progress in agriculture, even interior decoration and plumbing. Over 500 illustrations point up the text.

Fundamentals of Electrical Engineering

V. P. HESSLER, Ph.D. Professor of Electrical Engineering, University of Illinois, and **JOHN J. CAREY,** Associate Professor of Electrical Engineering, University of Michigan. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 241 pages. Diagrams, tables, charts, formulas, appendixes I through X, index. $3.50.

One of the "Electrical and Electronic Engineering Series." An outline of the concepts of electricity and magnetism, written to give the reader a foundation for work in electrical engineering. Extensive treatment is given to unit systems and dimensional analysis, and the tables of dimensional formulas, conversion formulas, characteristics and capacities of vari-

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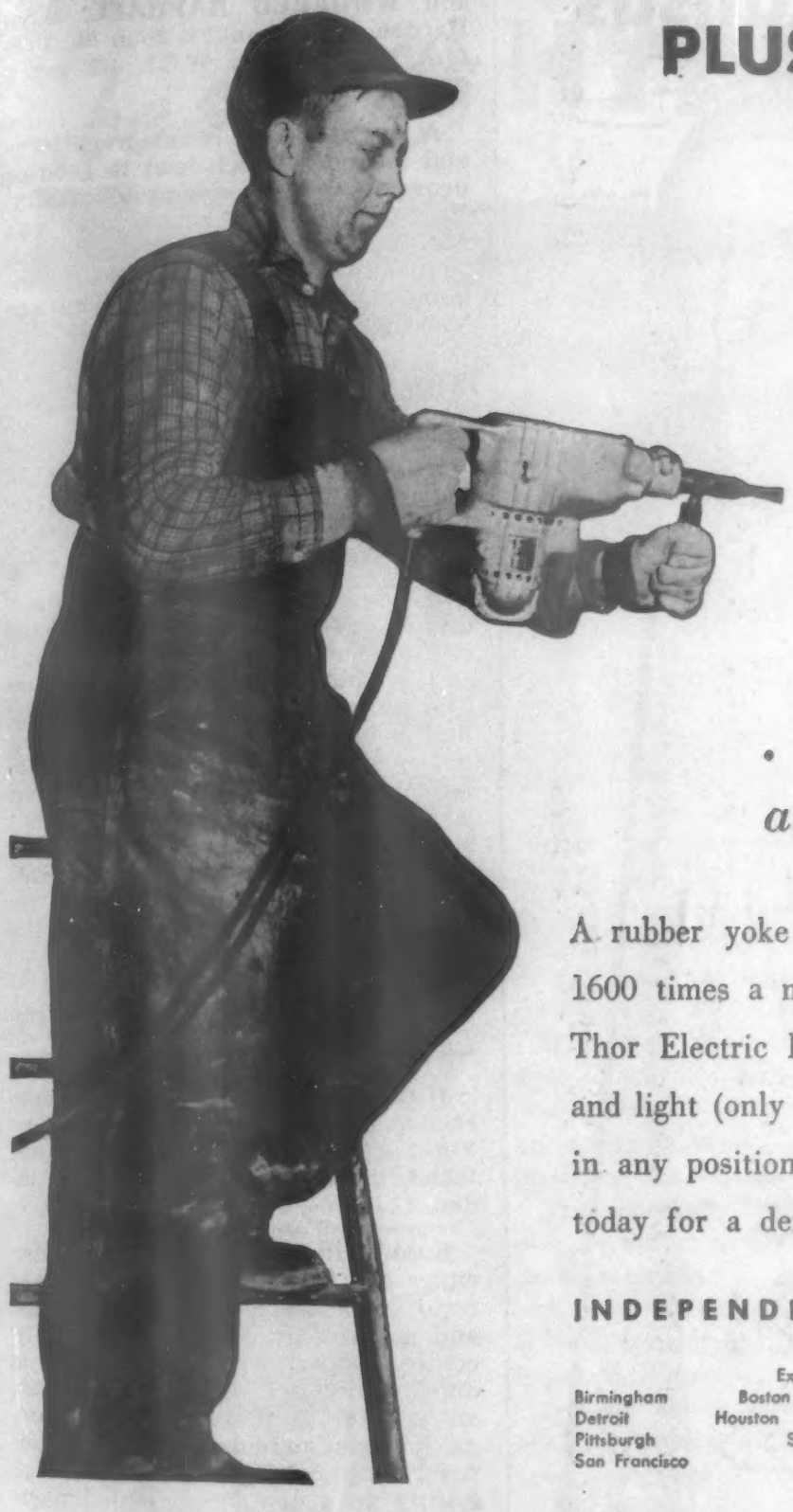

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WILFRED B. D. BROWN, M.B.E., and **WINIFRED RAPHAEL,** B.Sc. Macdonald & Evans, 8, John St., Bedford Row, London W.C.1. 163 pages. Chart. 10s. 6d.

A discussion of behavior patterns and attitudes which lead to good or poor human relationships in industry. The problems of management and the authors' suggested solutions, "outside consultants," and recommended training for management are also included.

The Foreman in Industrial Relations

ROBERT DAVID LEITER, Ph.D. Columbia University Press, Morningside Heights, New York. 200 pages. Bibliography, index. $2.50.

Divided into three parts, the book discusses The Problem of the Status of Foremen, The Historical Evolution of the Unionization of Foremen, and The Impact of Legislation on the Status of Foremen. It was written before the Labor-Management Relations Act of 1947 was enacted, but it was prepared with the idea that some such legislation would be put into effect, and the author discusses the effect on industry of "the removal of legal protection from the organization of foremen."

Quality Control in Industry —Methods and Systems

JOHN G. RUTHERFORD. Pitman Publishing Corp., 2 West 45th St., New York. 201 pages. Sketches, diagrams, tables, graphs, formulas, appendix, index. $3.50.

Subtitled: "Combining the principles and statistical techniques that result in better control, cost savings, and a smoothly functioning quality control department." The book is divided into two sections. The first, on general principles, presents organizational and administrative practices, with detailed suggestions for setting up a quality control department. The second part explains and illustrates statistical methods, sampling procedures, process control, and their practical application.

BOOKLETS

INDUSTRIAL AIR SAMPLING AND ANALYSIS. Leslie Silverman, Sc.D., Assistant Professor of Industrial Hygiene, Harvard School of Public Health. Chemistry and Toxology Series, Bulletin No. 1. Industrial Hygiene Foun-

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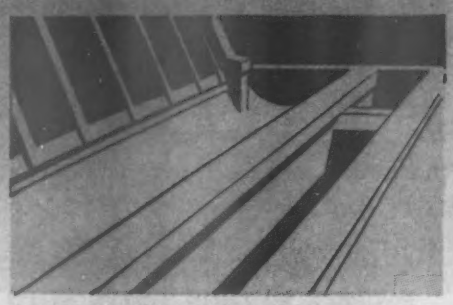

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